ANALYSIS OF NMCUES DATA

Deliverable 106B

Health Status Metodology Report

Use of Functional Limitations Battery

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Methodology Report #106H

Health Status Methodology Report and Use of Functional Limitations Battery

There were two draft Methodology Reports on Health Status prepared in 1982. The first an exploratory report by Dr. William Wadman, Discussing the use of Health Status Data found in NMCUES (3-26-82). Later, (6-25-82) Dr. Jon Conklin prepared a methodology for a Health Status Index of Functional Limitations, which encompassed the material discussed in the earlier report.

Dr. Conklin subsequently developed the Functional Limitations Scale Score. His consultation with Ware and Brook of RAND is documented as well as the complete description of the index construction.

Additional work was done at RTI; editing and statistically imputing scores in situations where the functional limitation battery was not administered. Four subscales were also created.

The seven documents attached constitute the body of activity conducted with the Rand functional limitations supplement as it was adapted for use in the 1980 National Medical Care Utilization and Expenditure Survey (NMCUES). The documents include a review of health status measures in the NMCUES, memos describing scaling and imputation activity, actual scaling output, production of subscales, and a copy of the functional limitations supplement. Substantial combination of items and imputation were required to produce a seven level unidimensional scale. This experience, however, paralled the Rand experience with essentially the same battery. The result of this activity has been the validation of the functional limitations scale variable for the civilian, noninstitutionalized population a well as for several population subgroups defined by age and insurance status.

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Attachment I

A HEALTH STATUS MEASURES IN THE NMCUES ANALYSIS DATA

Introduction

This document presents information on direct and indirect measures of Health Status in the NMCUES data including the development of an aggregate measure of health status in the form of an index for Functional Limitations. The measurement of health status is a key concern for the analyses of NMCUES data. In theory, both the extent to which a person seeks and uses medical care services as well as the cumulative costs of those services are directly related to a person's health status (other things being equal, e.g., access to medical care)

The various household survey components of the NMCUES collected data for a wide range of topics related to health, access to and use of medical services, the associated costs and sources of payment, and health insurance coverage. A number of questionnaire items elicited detailed information about the health status of each person within the sampled households. (1) Specific health conditions denoting departures from a state of physical or mental well-being) were reported in several different parts of the survey instrument. The conditions that were originally listed in the various sections of the instrument have since been cross-linked and grouped so that a profile of the health conditions presented by each person over a period of time and the various physician encounters for each condition can be identified. In addition, chronic conditions can be grouped separately from acute conditions to indicate severity of illness. (2) One section in which health conditions were reported focused on disability days (i.e., the days that a person was affected by illness or injury). The number of disability days associated with each condition was recorded for three basic issues: whether or not the illness or injury kept the person in bed, kept the person from work, or caused the person to cut down on the things he or she usually did. (5) People in each household were also asked directly about their self-perceived health status. They were asked to describe their health as excellent, good, fair, or poor. (4) A series of questions were asked to identify the extent to which health problems were severe enough to limit a person's ability to engage in certain activities. These activity limitation items were designed so that people could be grouped according to whether they: could not perform a usual activity (e.g., relating to school work, housework, or job), could perform a usual activity but were limited in the kind or amount, could perform a usual activity but were limited in the kind or amount of another activity, or were not limited. The health condition causing each limitation was also recorded. (5) Another battery of questions was

asked of persons 17 years of age and over to assess their ability to perform various functions. The entire functional limitations battery (consisting of 13 items) was administered to all people in a five percent random sample of reporting units, while people in the remaining 95 percent of the sample were asked to complete the battery only if some limitation was reported in either of two initial questions. The specific items in the battery each identified separate areas in which people were limited in their ability to function (e.g., walk, drive a car) due to health problems. Unlike the other health status indicators, there was no clear indication as to how to combine the items in this battery so that people could be ranked in terms of their health status. (6) Some measures contained in the survey instrument did not assess health status directly but can be used as proxy variables. For instance, the total number of visits to physicians or hospitals may provide an overall indication of poorness of health even though individuals vary greatly in their proclivity to use medical services for given health problems.

Clearly, there are different ways to measure health status. In fact, several different types of indicators are available on the NMCUES data base. Perhaps the best overall strategy for analysis would be to combine these various indicators to create a single comprehensive index of health status. However, before such efforts can be initiated, it is essential that each of the separate indicators be quantifiable or at least be expressable in meaningful units. Fortunately, most of the health status concepts underlying the indicators described above can be easily operationalized. The clear exception is the functional limitations battery. As they stand, the 13 separate items define 13 different types of limitations which, while intuitively varying in severity, have not been scaled in a quantifiable manner. The purpose of this investigation is to derive an index of health status in which the items on the functional limitations battery are scaled on a continuum so that any person 17 years of age or older can be assigned a scale value. This scale will be formulated and validated in several populations of interest on the basis of both analytical and theoretical criteria.

The Functional Limitations Battery

The various items on the functional limitations battery are summarized in Table 1. As can be seen, the items ask questions about physical abilities that are necessary to function in daily life (e.g., walking, bending, driving, getting around without assistance, etc.). People were asked whether they were limited in these various functions as a direct result of their health. If they responded that they were limited, a follow-up question was asked to determine whether their limitation had been present for a period of three months or more. This provided an indication of which limitations were of a chronic (as opposed to acute) nature.

TABLE 1: FUNCTIONAL LIMITATION ITEMS

Item #	Description
	Does health limit you in:
1, 3 - 1A, 3A	vigorous activities? - for more than 3 months?
2, 15 - 2A, 15A	anything you want to do? - for more than 3 months?
4 - 4A	ability to drive a car? - for more than 3 months?
5 - 5A	getting around community without assistance? - for more than 3 months?
6 - 6A	causing you to stay indoors most of the day? - for more than 3 months?
7 - 7A	causing you to stay in bed or chair most of the day? - for more than 3 months?
8 - 8A	ability to bend, stoop, lift? - for more than 3 months?
9 - 9A	ability to walk one block or climb one flight of stairs? - for more than 3 months?
10 - 10A	ability to walk several blocks or climb several flights of stairs? - for more than 3 months?
11 - 11A	ability to walk without assistance? - for more than 3 months?
12 - 12A	doing certain kinds/amounts of work? - for more than 3 months?
13 - 13A	ability to work? - for more than 3 months?
14 - 14A	ability to eat, dress, bathe, etc.? - for more than 3 months?

The functional limitations items used in the NMCUES were adapted directly from a set of items that were developed by RAND to be used in the Health Insurance Study (HIS; Stewart, et al, 1978). RAND had originally designed the items so that they would be easy to scale. The scales they derived were used in the HIS and were the subject of several publications. The items used in the NMCUES are almost identical to those designed by RAND, but slight modifications of several items and follow-up questions were made to better adapt the battery to the study's interview format.

A copy of the functional limitations battery, as it was actually administered in the NMCUES, is included in the Appendix. The numbers in parentheses adjacent to the item response codes denote the item numbers to which respondents were branched when they responded in certain ways. As can be seen, people who were under 17 years of age or who had deceased during the NMCUES study year were screened out by the initial question in the section. People 17 years of age and older were categorized according to whether they were from households in the five percent "FL sample" or whether they were from households making up the "non-FL sample." All people in the FL sample were administered items 3 through 15. This defined a random subsample that responded to all items regardless of the presence or absence of health problems or limitations. People in the non-FL sample were first administered items 1 and 2. Those that indicated they were limited on one of those two items were then administered items 4 through 15. Thus, in the non-FL sample, only people with limitations (at least of the kinds asked in items 1 and 2) were administered the full battery of items. On the questionnaire, items 1 and 3 are identical, and items 2 and 15 are identical for people who do not indicate any limitations on other items. Further information about the sample and item characteristics is provided below.

Sample and Item Characteristics

On the basis of preliminary analytical results, several points of interest can be made about the make-up of the sample and general patterns of response to the items. In total, the NMCUES data base consists of 31,024 people. In terms of their status on the functional limitations battery, these people can be broken out as follows:

			69 (Deceased)	Not administered functional limitations battery
31024	29464		8872 (Under 17)	
NMCUES Sample	Valid Codes for initial screening item	19514 (Non-FL Sample)		16428 (Under 65)
				3086 (Aged)
		1009 (FL Sample)		863 (Under 65)
				146 (Aged)

Of the original 31,024 people in the sample, only 29,464 responded with valid codes on the initial screening item. Of these, 19,514 people were from households in the non-FL sample while 1,009 people were from households in the FL sample (the fact that this represents less then 5% of the total sample may indicate that a larger proportion of people in FL households were under 17 or deceased). These samples have been further broken down into aged and non-aged cohorts to define subpopulations that will be used in the scaling efforts below.

Certain characteristics of the responses to functional limitation items are worth noting:

* In the data files that were made available for this scaling effort, no person from the FL sample had valid response codes (1,2 or 3) for item 4 (driving a car). As a result, the item was excluded from all scaling analyses that focused on the FL sample.

* All people (in both samples) that indicated they were limited on item 9 had invalid response codes for item 10. The implicit assumption was that people with limitations on item 9 (walking one block) were by definition limited on item 10 (walking several blocks), and consequently the second item was skipped. For purposes of this scaling effort these items have been recoded to define a consistent order (i.e., if YES on #9 then YES on #10; however, if YES on #10 not necessarily YES on #9).

* All people in the non-FL sample that indicated they were limited on item 1 proceeded to item 4, skipping item 2. The implicit assumption was that people limited in vigorous activities were by definition limited in at least something they wanted to do.

* Of those people in the non-FL sample that indicated they were limited on either item 1 or item 2 (6577 of the 19514) only 48 people (less than one percent) had valid codes for item 15. As a result item 15 was excluded from all scaling analyses that focused on the non-FL sample.

* Of the 6577 people in the non-FL sample indicating limitations on either of the first two items, 6234 people (nearly 95 percent) indicated they were limited on item 1 and then skipped item 2. Only 343 people responded NO to item 1 but YES to item 2 (even though, in theory, item 2 should identify limitations of lesser severity than item 1). For this reason,m item 2 was also excluded from the scaling efforts for the non-FL sample (even if it were recoded for consistency with item 1 it would only provide redundant information).

Alternative Approaches to Scaling

Unfortunately, the 13 separate functional limitation items in their current state don't provide much help in defining a person's health status. They need to be combined so that a numerical index denoting the severity of limitation can be derived. There are a number of alternative analytical approaches for deriving scales from collections of items. Factor analysis is a method that is commonly used for quantitative items (i.e., items whose response codes range on a continuum - not true of the functional limitation items). This approach essentially attempts to decompose the matrix of intercorrelations between all item pairs so as to identify cohesive groups of items that are highly interrelated. These groups of items define "factors' that have common unidimensional underlying traits. Factor scores can be computed by weighting the individual item scores by their factor "loadings" and summing them up. Multidimensional scaling is an approach that is used for data that describe the proximities or distances between items (not obtained for functional limitation items). This method also attempts to identify cohesive groups of items and ranks item groups in terms of their relative proximities. Scales may also be derived as multi-item composites. Items can be created and grouped according to theoretical criteria, and their conformance to an underlying scale dimension can be assessed using classical item analysis methods (e.g., internal consistency reliability, item discriminability, etc). This enables a subset of items to be identified that are assumed to measure a unidimensional trait, and scale scores can be computed by merely summing up the individual item scores. While this approach could be used for the functional limitations battery, any sum of the individual item scores would merely indicate the total number of limitations reported.

Because of the great extent of overlap between the items, and the fact that some limitations are clearly more severe (and thus deserve more weight) than others, the actual meaning of such a total would be questionnable.

Item response patterns can also be examined to assess the extent to which they conform to a cumulative scale. Cumulative (or Guttman) scaling is a method that is used to scale items that appear to vary in severity or intensity. The underlying assumption of the approach is that items can be ordered in terms of their severity and that responses to the items will follow a specific pattern such that a person responding positively to any high item on the scale will also respond positively to any lower item on the scale. Because most of the early developmental work on cumulative scales was conducted by Guttman (1944), the approach is generally referred to as Guttman scaling. The items on the functional limitations battery do appear to vary in severity. In fact, the battery was initially designed by RAND so as to conform to a cumulative scale. All of the efforts by RAND to scale the items have used the Guttman scaling approach (Stewart, Ware, & Brook, 1977, 1981).

Guttman Scaling

Guttman scale analysis is a method of analyzing the response patterns of three or more items in order to determine if they meet two specific properties. The first property is unidimensionality. Items must vary in degree or intensity along the same single underlying dimension or construct. In the case at hand, this dimension could be called "severity of limitation." Second, guttman scales must be cumulative. As described above, this implies that the items can be ordered by degree of difficulty (or severity) and that respondents who reply positively to a difficult item will always respond positively to a less difficult item (also, respondents who respond negatively to a less difficult item will always respond negatively to a more difficult item). A person is assigned a scale value according to how many items were responded to positively. An example of a Guttman scale is presented in Table 2. The underlying dimension measured by this scale is "Love of Pizza." The four separate items in the scale are listed at the top. The response options of NO and YES have been coded 0 and 1 respectively. The triangular pattern to the positive (or negative) responses indicates that the scale is cumulative.

Guttman scale analysis creates a table (called a scalogram) of the responses to items which have been ordered according to their difficulty (severity), and assesses the extent to which the items conform to a perfect Guttman scale. Naturally, it is rare that a group of items will be found that perfectly conform to a Guttman scale. A few response errors that violate the pattern are usually

TABLE 2: A SAMPLE GUTTMAN SCALE

Scale Values	(Item 4) Can Eat Whole Pizza	(Item 3) Can Eat Half Pizza	(Item 2) Can Eat Two Pieces	(Item 1) Can Eat One Piece
4	Yes	Yes	Yes	Yes
3	No	Yes	Yes	Yes
2	No	No	Yes	Yes
1	No	No	No	Yes
0	No	No	No	No

obtained. The actual goal of Guttman scaling is to assess whether or not a set of items elicit response patterns that conform close enough to the Guttman scale criteria to be treated as such. The basic measure of how close a pattern of responses conforms to a Guttman scale is the coefficient of Reproducibility. The coefficient of reproducibility is defined as: one minus the ratio of total number of errors to total number of responses (here, errors are defined as item responses that do not conform to the pattern necessary for a perfect Guttman scale). The closer this coefficient is to 1.0, the greater the likelihood that the items define a unidimensional, cumulative scale. On the surface, this coefficient appears as though it should range between zero and one. However, the reproducibility of an item can never be less than the proportion of respondents in its largest category, and the reproducibility of a scale is equal to the average reproducibility of its items. For this reason, reproducibility may have a high expected value even when the items are known to be completely independent. Thus, if a scale consists of several items whose response patterns are highly skewed, the absolute minimum value for reproducibility might be around .85. In such a case an obtained reproducibility value of .90 might not seem high enough to enlist confidence in the scale. Another measure of fit, the coefficient of scalability, assesses the percentage improvement over the minimum marginal reproducibility that is provided by the obtained coefficient of reproducibility. A scale is generally assumed to be unidimensional and cumulative if its coefficient of scalability is greater than .60 (i.e., there is a 60% improvement over minimum reproducibility).

For the scaling of the functional limitation items, standard Guttman scale analyses were used. The items or subsets of the items were arranged in order of their percentages of YES responses. The actual response patterns were then examined and responses that were inconsistent with the pattern required of a perfect Guttman scale were denoted as errors. The coefficients of reproducibility and scalability were then computed to assess the fit of the items to scale criteria. When a scale of items failed to fit these criteria, items are dropped or recombined and a new scale was formed and tested.

RAND's Scaling Studies

In the earlier RAND studies (Stewart et al, 1977, 1978) the functional limitation items were analyzed using Guttman scaling methods, and several short scales were defined. In terms of items 3 through 15 in Table 1, the scales they derived and the order of the component items in terms of severity were: Mobility (ite$ 4, 5, 6, and 7), Physical Activities (items 3, 10, 9, 8, and 11), Role Activities (items 12 and 13), Self-Care Activities (item 14), and General Limitations (item 15). The data examined by RAND had been collected for several different study sites. To define a scale as valid RAND required it to meet Guttman scaling criteria in each of the sites.

In a later study, (Stewart et al, 1981) an attempt was made to combine all of the items to form an aggregate Functional Status index. The strategy they used was to focus on a single site and attempt to derive an aggregate scale by combining the various subscales defined in the earlier studies. Separate scales were derived for "any limitations" and for "chronic limitations." In the course of their analyses several decisions were made about eliminating or combining items. Item 11 was dropped because its pattern of error responses indicated that the various types of assistance specified in the item represented various degrees of limitation. In addition, the four items defining the Mobility scale (items 4, 5, 6, and 7) were combined into a single scale level. This was also true of items 3 and 8. The items defining the Role Activities and General Limitations scales were found to define a separate index, and therefore were not combined with the others. A point of interest was made regarding apparent inconsistencies between item 15 and the remaining items. A number of people that indicated limitations on other items indicated that they were not limited in "anything" they wanted to do (item 15). The final result of the scaling analyses revealed two separate scale types: a Personal Limitations index and a Role Limitations index. The Personal Limitations index consisted of scale levels scored 1 to 5 according to whether limitations were indicated on items 3 and 8, item 10, item 9, items 4 through 7, and item 14 respectively. The Role Limitations index consisted of scale levels scored 1 to 3 according to whether limitations were indicated on item 15, item 12, and item 13 respectively.

Scaling Strategy

The primary objective of this scaling effort is to derive a single unidimensional, cumulative index to describe health status using the functional limitations battery. Although these efforts parallel those taken by RAND, they do not represent an attempt to merely validate its scales using NMCUES data. A similar strategy is used and similar issues are examined, but the current objective is to independently derive a scale that best fits the NMCUES data.

This scaling effort focuses on several different subpopulations. Its primary interest is to derive and validate a single scale that fits in the separate samples of: the general population, the Medicaid population, and the Medicare population. In addition, because of the nature of the FL and non-FL samples, separate analyses will be conducted in those two groups. The non-FL sample defines a better focal group for the analysis since the only people with complete item data are those with some kind of functional limitation (thus the distribution of responses is not so skewed as in the FL sample, resulting in a lower minimum reproducibility). However, since most people in the non-FL sample with complete data responded YES to item

1, it was excluded from those analyses (its inclusion would have resulted in a high minimum reproducibility value). To examine the fit of that item in the scale, the FL sample must be analyzed. The strategy taken in this effort was to focus first on the non-FL sample with complete data on items 4 through 14. Scales that were derived for that sample were then examined in the other samples. When a scale failed to fit in all samples, the error patterns and the matrix of item intercorrelations were examined to determine which items should be combined or eliminated.

Results

Several decisions were made regarding the treatment of individual items based on the results of preliminary analyses. First, all items were recoded to 0 to 1 (NO or YES) according to whether or not people reported that they were functionally limited as a direct result of their health. Second, the error patterns for item 11 were examined. No inconsistencies were found, and the decision was made to retain the item in the analysis. For the non-FL sample, items 2 and 15 were excluded from the analyses for reasons specified above. Two items (items 1 and 14) were found to have very highly skewed distributions (95% YES's on #1, 91% NO's on #14). Because they would contribute to high minimum reproducibilities and thereby reduce the scalability for the whole set of items, they were eliminated from the non-FL analyses. This is no problem for item 14, since it clearly defines the most severe limitation of all the items in the battery. Item 1 (identical to item 3) can be examined for inclusion in the scale when focusing on the FL sample (even though those analyses in turn exclude item 4). The "A" items following each of the functional limitation questions were examined to determine whether "chronic" limitations (more than 3 months) could be distinguished from "acute" limitations (less than 3 months). Preliminary analyses revealed that over 95% of the people indicating a limitation also indicated that limitation had been present for more than 3 months. For this reason no distinction between chronic and acute limitations was made.

The first emphasis of the scaling analysis was to examine the fit of the RAND subscales using NMCUES data. Parallel analyses were conducted in four subsamples: the non-FL sample, the Medicaid sample, the aged sample (as proxy for Medicare), and the FL sample. With the above restrictions on the inclusion of items, all five subscales were found to fit well in each of the samples. The coefficients of reproducibility were near or above .90 and all of the scalability coefficients were above .60 (most were between .75 and .90).

After validating the separate subscales, the various items were combined in an attempt to find a single scale that would span the complete set of items. The analyses were first conducted on the non-FL sample. Items 1, 2, 14, and 15 were excluded according to the

reasons presented above. The resulting scale of items 4 through 13 fit poorly with low reproducibility and scalability coefficients. An examination of the error patterns revealed that items 4 through 7 and items 12 and 13 were the primary sources of error, and that those items were apparently redundant. To address this problem, items 4 and 5 were combined as were items 6 and 7 and items 12 and 13. A positive response (indicating a limitation) to either of the items in each pair was coded as a positive response to the corresponding composite. Further analyses were performed on the non-FL sample, and this modified scale was found to fit marginally well. The scalability coefficient was .62, large enough for scaling purposes but hardly instilling great confidence in the scale. In parallel analyses of the other subsamples, the scalability coefficient fell below .60, thus the decision was made to further combine items. Rather than keeping separate composite pairs, items 4 and 5 and items 6 and 7 were all combined to create a single composite. This defines the Mobility scale derived by RAND and validated earlier on the NMCUES data. A limitation on the Mobility scale was therefore coded if a person was limited on any one of items 4 through 7. The scaling analyses were again performed first on the non-FL sample and then repeated on the remaining sample (though the composite was redefined to consist of items 5 through 7 in the FL sample due to the absence of data on item 4). The scale was found to fit well in each of the four subsamples. The reproducibility coefficients were all near or above .90 and three out of the four scalability coefficients exceeded .70.

After identifying the basic components of the scale, an attempt was made to examine the fit of previously excluded items (e.g., item 1 or 3 and item 14), by focusing on specific subsamples. Item 3 was introduced into the analyses of the FL sample, and, although it fit in the scale, the error patterns revealed some confusion between itself and item 8. Both items deal with physical activities of a more vigorous nature and therefore assess limitations of low severity. A scale which combined items 3 and 8 was found to fit markedly better than the scale in which they were included separately. Item 14 was introduced into the analyses of the aged population since for these people the item was not so skewed as it was for the general population. Scaling analyses revealed that the item fit well with the remaining items in the scale, and, consistent with theory, defined the most severe level of limitation.

Thus, even though all items could not be examined for fit simultaneously in one overall population, the separate analyses of subsamples was able to identify a viable scale for functional limitations. The core set of items was found to fit well for all subsamples, and, where the remaining items could be included, they too were found to fit. The final derived index of functional limitations is presented in Table 3. The items or item composites have been presented in their order of severity. The composite of items 1 (or 3

if in the FL sample) and 8 defines the low scale value of one (zero, or no limitations, is actually the lowest value). This level denotes limitations in vigorous and physical activities. The scale values of three and four are defined by item 10 and item 9, respectively, denoting the extent to which a person's health limits him or her in walking a reasonable distance or climbing stairs. The scale value of five is defined by the Mobility composite (combining items 4, 5, 6, and 7). It denotes the extent to which a health problem limits a person's ability to get around. Item 11 defines the scale value of six, which denotes the extent to which a person is able to walk at all without assistance. The final scale value of seven is defined by item 14 which indicates whether a person is limited in self-care activities. This then defines a seven-point Health Status index for functional limitations. While the items have been found to fit the scale in a statistical sense, many exceptions to the perfect response patterns that define the scale will be found in the real data.

Imputing Scale Values

Scale values must be imputed for two different types of response characteristics. The first consists of people who responded with complete data on all items but whose response patterns are inconsistent with those presented in Table 3. That is, they responded that they were limited on an item defining a high scale value, but they were not limited on one or more items defining low scale values. These types of responses can be denoted as error patterns insofar as the Guttman scale is concerned. The second response characteristic for which data must be imputed is missing data. A person may respond to most of the items on the scale but for various reasons (refusal, coding error, keypunch error, etc.), may have an invalid code on one or more other items. Both kinds of imputations and decision rules for making them are examined below. The general approach taken did not involve examining all of the 128 possible response patterns, but rather focused on theoretical concerns.

To impute scale values for people responding with error patterns, several decisions must be made based solely on theoretical criteria. If the various types of error patterns are considered, it is clear that they vary in severity and difficulty of imputation. On the one hand, if a person has responded YES to several adjacent items of high scale value and NO to one or two items of low scale value (e.g., if 0's and 1's denote NO's and YES's, and items are arranged from most to least severe, such patterns as: 0111110, 0111100, 0111011, etc.), it seems clear that the scale value associated with highest (or most severe) positive response should be assigned (e.g., for the above examples a scale value of 6 would be assigned). On the other hand, it is more difficult to assign a scale value for a person responding YES to one item but NO to several adjacent lower items (e.g., 0100000, 0100111, 0101010, etc.). To make a decision regarding such

imputations it is important to consider the meaning that might underly the response patterns. The essential question is: if a "0" appears to the right of a "1" which of the two is an error? In the simplest case, the presence of only a single "0" to the right of a "1" will be disregarded; i.e., the value corresponding to the highest "1" will be assigned. The possibility that the YES response on the "high" item is in error increases with the number of adjacent lower items that are responded to as NO. It is more likely that the left most "1" in the pattern 0100000 is in error than the same "1" in the pattern 0101111. This is true because the functional limitation items do not scale perfectly, and some items may represent abilities that are mutually exclusive. For instance, a person may not be able to walk without mechanical assistance but can still get around the community and can drive a car. On the other hand, such a person is unlikely to be able to engage in vigorous activities. Another consideration is that several items, especially items 9 and 10 (defining scale values 4 and 3 respectively) are interdependent in that they measure the same kind of physical ability but differ in degree. It is possible that both of such items will be responded to similarly depending on whether the limitation is related to that physical ability or not. Because of this possible response tendency, the decision has been made to impute, for any error pattern, the value corresponding to the highest YES response that is not followed by three or more adjacent lower NO responses on the scale. Thus, a pattern of 0100111 is given the value of 6, while a pattern of 0100001 is given the value of 1. It is important to note that items 2 and 15 from the original Functional Limitations battery have been eliminated from the scale. Because of the variety of ways in which those items could have been interpreted (e.g., some people may focus on the phrase "doing anything," while other people might focus on "anything you want to do"), and the various error responses that resulted (YES on other items, but NO on item 2 or 15), the decision was made to focus entirely on the items making up the scale. Items 2 and 15 are completely disregarded when assigning scale values to response patterns.

To impute scale values for people responding with missing data the overriding concern is one of validity. It is questionnable whether any values should be imputed if no data is available. Some techniques for predicting values based on other person characteristics are beyond the scope of this exercise. If a person has too much missing item data, then a valid imputation may be impossible, and it may be better to exclude the person from the analyses than to risk possible bias in the results. For this reason, the decision has been made to exclude, from further analyses, any person for whom fewer than half of the scale items (in some cases, combinations of the original functional limitation items) have legitimate codes (YES or NO). Those persons that are excluded will be assigned a missing value code for their scale value. It is important to note that this rule does not apply to people in the non-FL sample who responded NO to both items 1

and 2 and therefore skipped items 4 through 14. Consistent with the underlying assumptions of this branching rule, these people will be given a scale value of zero, as if they had responded NO to all of the items on the scale. For people responding correctly to most items but having a few missing values to two rules can be made. First, for scale points defined by a combination of items (e.g., scale points 1, 2, and 5), the response code can be assigned on the basis of the non-missing component items. If all component items for a composite are missing then that scale point must also be missing. Second, for general purposes of imputation, missing values for scale points will be treated as if they were NO responses, and the same imputation rules described above for error responses will be applied.

Conclusion

The Health Status index derived for functional limitations looks much like RAND's Personal Limitations Index (Stewart, et al, 1981). However, they excluded items 11, 12, and 13 from their scale. In other respects the scales are identical. The scaling approaches and the various steps taken by RAND and in the current effort were parallel and the results were similar. With such a scale derived for functional limitations, future efforts can concentrate on combining information from various sections on the NMCUES instruments to create an overall comprehensive Health Status Index.

REFERENCES

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Stewart, A. L., J. E. Ware, Jr., R. H. Brook, CONSTRUCTION AND SCORING OF AGGREGATE FUNCTIONAL STATUS INDEXES: VOL. I & II. The Rand Corporation, R-2551-HHS, January 1981.

Imputations of Functional Limitation Scale Scores

In an earlier paper describing the creation of the Functional Limitations scale, a simple imputation rule was defined for assigning scale scores to error response patterns and patterns of missing item data. At that time, the scaling validation efforts had to be conducted with different items for different subgroups of the NMCUES population because of the absence of complete item data for certain subgroups. No validation of the scale was possible on the total population. Since the earlier analyses, certain data problems have been corrected (e.g., item #4 now has complete data for both FL and non-FL samples), and validation of the full scale is now possible on the total NMCUES population. It is also possible to examine the full range of response patterns (including those with missing data), and thereby formulate a more sophisticated imputation scheme for assigning scale scores.

During the actual administration of the functional limitations questionnaire by interviewers, a large number of people skipped items because of the branching scheme that was used. For those people, missing-value condition codes were assigned in place of potentially valid responses for the items that were skipped, despite the fact that the central assumption for branching was that they would have given a specific valid response had each item not been skipped. Because the presence of these condition codes dramatically reduces the validation sample and defines an inaccurate distribution of response patterns, the scaling analyses are affected. Consequently, prior to assessing the validity of the functional limitations scale, a number of item recodes had to be made:

* All people in the non-FL sample who responded NO to both items #1 and #2, and who therefore skipped all remaining FL items on the assumption that they would respond negatively to those items as well, were assigned NO responses to items #4-#15.

* A small group of people in the non-FL sample who responded NO to item #1 but had missing values for all remaining items were also assigned NO responses to items #4-#15.

* All people (in both the FL and non-FL groups) that indicated they were limited on item #9 had missing value codes for item #10. Under the assumption that people with limitations on item #9 (walking one block) were by definition limited on item #10 (walking several blocks), item #10 has been recoded to YES for all people that responded YES to item #9.

* For item #4, response codes of "2" and "3" were coded as NO responses since neither denoted an inability to drive a car caused by health problems.

The original scaling efforts on the functional limitations battery (described in the earlier paper) focused on the 12 separate items (item #15 was eliminated due to missing and inconsistent responses). Examination of error patterns indicated that some items were highly interrelated and should be combined. As a result, the final functional limitations scale consists of three sets of item combinations. For scale level 1, "vigorous activities", item #1 (or #3, for the FL sample) and item #8 were combined. For scale level 2, "Doing Work", items #12 and #13 were combined. In terms of the code values for the item combinations, the item responses were combined according to the following rules:

1. If there is a YES response to any of the component items, regardless of the other item responses, the item combination is assigned a YES response.

2. If the responses to each of the component items are missing then the item combination receives a missing-response code.

3. If there are NO responses to each of the component items then the item combination is assigned a NO response.

4. If some items have NO responses and others have missing responses then the item combination is assigned a NO response.

Using the recoded item data and these item combinations, we have recently assessed the validity of the Functional Limitations Scale on the total NMCUES population. Of course, this applies only to those people 17 years of age and older. Using the standard Guttman Scalogram approach, the complete scale (all 7 items) was found to fit exceptionally well. The obtained coefficient of Reproducibility was .975 and the Coefficient of Scalability was .8451. A scalability of .60 or higher is typically considered high enough to define a unidimensional, cumulative scale. Thus, while in previous analyses the scale was validated on various subgroups of the NMCUES adult population, this indicates that the scale is valid for the total adult population as well.

There remains the issue of scale-score imputation. With seven scale levels, the potential number of error response patterns and missing data patterns is large. In these data, 98 distinct response patterns were obtained. These are presented in the table accompanying this paper. Of the total number of response patterns, 8 correspond to perfect scale patterns, and scale scores (0-7) can be directly assigned. For the remaining 90, scores must be imputed. The basic imputation rule developed for this effort differs from the rule defined in the earlier paper. The previous imputation rule was liberal in that it usually gave the benefit of the doubt to the most severe functional limitation indicated, despite apparent inconsistent responses to less severe items. The previous rule was also simplistic and did not consider the various interpretations of alternative response patterns. The current imputation rule described below is very similar to the strategy used by RAND in their development of the Personal Limitations Index. The basic rules are described as follows, and are used to assign scale scores in the accompanying table.

1. When a YES response to a more severe limitation is accompanied by a NO response to the next less severe limitation, then the YES is treated as a NO.

2. When YES responses are obtained to two adjacent items, then the score value imputed is the scale level of the most severe limitation of the adjacent YES responses.

3. When more than 50% of the original FL items (prior to formation of item combinations) are missing, or when a scale value cannot be logically imputed, a score of 99 is assigned.

4. Generally, for cases with less than 50% missing items, a missing response to a scale level more extreme (in terms of limitations) than an obtained YES response is treated as if it were a NO response. A missing response to a scale level adjacent and less extreme than an obtained YES response is treated as if it were also a YES response.

5. Exceptions to the above rules are made when the patterns of responses suggest that a functional limitation is truly present despite apparent inconsistencies in YES, NO, and missing responses. In these cases, decisions are based on theoretical considerations.

6. People in the NMCUES population that are deceased or under 17 are assigned a score of 98.

Currently, the recoded functional limitation items, the item response patterns, and the imputed scale scores for all people in the NMCUES population have been saved on computer files and have been forwarded to both SMI - Bethesda and RTI. At the request of the Project Officer, four of the five RAND subscales are currently being created and values imputed for inclusion in the same files. The fifth subscale consists of the general limitations item (item #15) which is missing for the large majority of the NMCUES population, and will therefore not be created.

Table :

FUNCTIONAL LIMITATION SCALE: RESPONSE PATTERNS, UNWEIGHTED SCALE SCORES

Pattern Number	Response Pattern							Number of Persons	Scale Score
	(Item 14) Limited in Self-care	(Item 11) Need Assistance Walking	(Items 6,7) Limited in Mobility	(Item 9) Trouble walking one block or climbing one flight of stairs	(Item 10) Trouble walking several blocks or climbing a few flights of stairs	(Items 17,18) Limited in ability to do work	(Items 1,3,8) Limited in Strenuous Activities		
1	NO	NO	NO	NO	NO	NO	NO	11515	0
2	NO	NO	NO	NO	NO	NO	YES	5	1
3	NO	NO	NO	NO	NO	YES	NO	40	0
4	NO	NO	NO	NO	NO	YES	YES	770	2
5	NO	NO	NO	NO	YES	NO	NO	12	1
6	NO	NO	NO	NO	YES	NO	YES	324	3
7	NO	NO	NO	NO	YES	YES	NO	14	1
8	NO	NO	NO	NO	YES	YES	YES	599	3
9	NO	NO	NO	NO	MISSING	NO	NO	1	0
10	NO	NO	NO	NO	MISSING	NO	YES	7	1
11	NO	NO	NO	NO	MISSING	YES	YES	10	2
12	NO	NO	NO	YES	YES	NO	NO	12	1
13	NO	NO	NO	YES	YES	NO	YES	217	4
14	NO	NO	NO	YES	YES	YES	NO	5	4
15	NO	NO	NO	YES	YES	YES	YES	4.0	4
16	NO	NO	NO	MISSING	NO	NO	YES	1	1
17	NO	NO	NO	MISSING	YES	YES	YES	1	3
18	NO	NO	NO	MISSING	MISSING	NO	YES	1	1
19	NO	NO	NO	MISSING	MISSING	YES	YES	1	3
20	NO	NO	YES	NO	NO	NO	NO	14	2

Table F cont.

Pattern Number	Response Pattern: (Item 6) Limited in Self-care	(Item 11) Need Assistance Walking	(Items 4-7) Limited in Mobility	(Item 9) Trouble walking one block or climbing one flight of stairs	(Item 10) Trouble walking several blocks or climbing a few flights of stairs	(Items 17,19) Limited in ability to do work	(Items 1,2,8) Limited in Vigorous Activities	Number of People	Scale Score	Notes
21	NO	NO	YES	NO	NO	NO	YES	66		
22	NO	NO	YES	NO	NO	YES	NO	55	2	→ Although this pattern is similar to pattern #3, the additional response of limitation (in mobility items) provides more confidence to the YES response for "doing work". As a result a score of 2 is imputed.
23	NO	NO	YES	NO	NO	YES	YES	205	1	
24	NO	NO	YES	NO	NO	YES	MISSING	1	2	→ For certain patterns of limitations on Mobility items, people in this group were assigned a scale score of 5.*
25	NO	NO	YES	NO	YES	NO	NO	1	5	
26	NO	NO	YES	NO	YES	NO	YES	42	5	
27	NO	NO	YES	NO	YES	YES	NO	7	5	
28	NO	NO	YES	NO	YES	YES	YES	255	1	→ For certain patterns of limitations on Mobility items, people in this group were assigned a scale score of 5.*
29	NO	NO	YES	NO	MISSING	NO	YES	1	5	
30	NO	NO	YES	NO	MISSING	YES	NO	3	2	→ Although this pattern is similar to pattern #3, the additional response of limitation (in mobility items) provides more confidence to the YES response for "doing work". As a result a score of 2 is imputed.
31	NO	NO	YES	NO	MISSING	YES	YES	6	2	
32	NO	NO	YES	YES	YES	NO	NO	2	5	
33	NO	NO	YES	YES	YES	NO	YES	39	5	
34	NO	NO	YES	YES	YES	YES	NO	6	5	
35	NO	NO	YES	YES	YES	YES	YES	875	5	
36	NO	NO	YES	MISSING	MISSING	YES	YES	3	5	
37	NO	NO	MISSING	YES	YES	NO	YES	1	4	
38	NO	NO	MISSING	MISSING	MISSING	NO	MISSING	1	99	→ Adults who have more than half of the original 11 items missing, or for whom it is impossible to impute a score value, were assigned a missing value of 99.
39	NO	YES	NO	NO	NO	YES	YES	12	1	
40	NO	YES	NO	NO	NO	YES	YES	2	2	

*The mobility items are, in order: Items 4,5,6, and 7:
Item 4 - Can't drive a care due to health
Item 5 - Need assistance to travel around community
Item 6 - Stay indoors due to health
Item 7 - Stay in bed/chair due to health
In the response patterns identified above, a scale score of 5 is imputed for all people responding YES to at least three of the four mobility items

	Response Pattern									
Pattern Number	(Item 6) Limited in Self-care	(Item 11) Need Assistance Walking	(Items 4-7) Limited in Mobility	(Item 9) Trouble walking one block or climbing one flight of stairs	(Item 10) Trouble walking several blocks or climbing a few flights of stairs	(Items 12,13) Limited in ability to do work	(Items 1,2,8) Limited in Vigorous Activities	Number of People	Scale Score	Notes
41	NO	YES	NO	NO	YES	NO	YES	1	3	
42	NO	YES	NO	NO	YES	YES	YES	11	3	
47	NO	YES	NO	YES	YES	NO	YES	4	4	
44	NO	YES	NO	YES	YES	YES	YES	59	4	
45	NO	YES	YES	NO	NO	NO	YES	2	6	
46	NO	YES	YES	NO	NO	YES	NO	2	6	
47	NO	YES	YES	NO	NO	YES	YES	33	6	
48	NO	YES	YES	NO	YES	NO	YES	1	6	
49	NO	YES	YES	NO	YES	YES	NO	1	6	
50	NO	YES	YES	NO	YES	YES	YES	21	6	
51	NO	YES	YES	YES	YES	NO	YES	5	6	
52	NO	YES	YES	YES	YES	YES	NO	1	6	
53	NO	YES	YES	YES	YES	YES	YES	355	6	
54	NO	YES	YES	MISSING	YES	YES	YES	1	6	
55	NO	MISSING	NO	NO	NO	NO	YES	1	1	
56	NO	MISSING	MISSING	NO	MISSING	MISSING	YES	1	99	→ Adults who have more than half of the original FL items missing, or for whom it is impossible to impute a score value, were assigned a missing value of 99.
57	YES	NO	NO	NO	NO	NO	YES	2	1	
58	YES	NO	NO	NO	NO	YES	NO	1	0	
59	YES	NO	NO	NO	NO	YES	YES	6	2	
60	YES	NO	NO	NO	YES	NO	YES	1	3	

Table 1 cont.

Pattern Number	Response Pattern: (Item 10) Limited in work	(Item 11) Need Assistance Walking	(Item 6,7) Limited in Mobility	(Item 9) Trouble walking one block or climbing one flight of stairs	(Item 10) Trouble walking several blocks or climbing a few flights of stairs	(Item E2,13) Limited in ability to do work	(Item 1,2,5) Limited in Vigorous Activities	Number of People	Scale Score	Note:
61	YES	NO	NO	NO	YES	YES	YES	3	3	
62	YES	NO	NO	YES	YES	YES	YES	12	4	
63	YES	NO	YES	NO	NO	NO	NO	1	99	→ No decision can be made about whether this person is limited or is not limited, therefore a score of 99 is assigned.
64	YES	NO	YES	NO	NO	NO	YES	1	4	
65	YES	NO	YES	NO	NO	YES	NO	8	2	→ Although this pattern is similar to pattern #3, the additional response of limitation to the mobility items provides more confidence in the YES response for "doing work". As a result a score of 2 is imputed
66	YES	NO	YES	NO	NO	YES	YES	21	2	
67	YES	NO	YES	NO	YES	YES	YES	19	3	→ For certain patterns of limitations on Mobility items, people in this group were assigned a scale score of 3.*
68	YES	NO	YES	NO	MISSING	YES	YES	1	2	
69	YES	NO	YES	YES	YES	NO	YES	1	5	
70	YES	NO	YES	YES	YES	YES	NO	1	5	
71	YES	NO	YES	YES	YES	YES	YES	311	5	
72	YES	NO	YES	MISSING	MISSING	YES	YES	3	5	
73	YES	YES	NO	NO	YES	YES	YES	1	2	
74	YES	YES	NO	YES	YES	YES	YES	5	2	
75	YES	YES	YES	NO	NO	YES	YES	2	7	
76	YES	YES	YES	NO	YES	YES	YES	6	7	
77	YES	YES	YES	YES	YES	YES	YES	393	7	
78	MISSING	NO	NO	NO	NO	NO	NO	1	0	
79	MISSING	NO	NO	NO	NO	YES	YES	1	2	
80	MISSING	NO	YES	YES	YES	YES	YES	1	9	

*The mobility items are, in order: Items 6,7,8, and 9:
Item 6 - Can't drive a car due to health
Item 7 - Need assistance to travel around community
Item 8 - Stay indoors due to health
Item 9 - Stay in bed/chair due to health
For the response patterns identified above, a scale score of 9 is imputed for all people responding YES to at least three of the four mobility items.

Pattern Number	(Item 16) Limited in Self-care	(Item 11) Need Assistance Walking	(Items 4-7) Limited in Mobility	(Item 9) Trouble walking one block or climbing one flight of stairs	(Item 10) Trouble walking several blocks or climbing a few flights of stairs	(Items 12,13) Limited in ability to do work	(Items 1,2,8) Limited in Rigorous Activities	Number of People	Scale Score	Notes
Response Pattern										
A1	MISSING	NO	YES	MISSING	MISSING	YES	YES	1	5	
A2	MISSING	NO	MISSING	MISSING	MISSING	MISSING	MISSING	1	98	People with this response pattern have FLAGE no. equal to 3 or 4 and are therefore probably not in the appropriate group for scaling. They are consequently assigned a score of 98.
A3	MISSING	YES	YES	YES	YES	YES	YES	1	6	
A4	MISSING	MISSING	NO	NO	NO	MISSING	YES	3	1	
A5	MISSING	MISSING	NO	NO	YES	MISSING	YES	1	3	
A6	MISSING	MISSING	NO	YES	YES	MISSING	YES	1	4	
A7	MISSING	MISSING	NO	MISSING	YES	MISSING	MISSING	1	98	People with this response pattern have FLAGE not equal to 3 or 4 and are therefore probably not in the appropriate group for scaling. They are consequently assigned a score of 98.
A8	MISSING	MISSING	NO	MISSING	MISSING	MISSING	YES	10	99	
A9	MISSING	MISSING	NO	MISSING	MISSING	MISSING	NO	10	98	People with this response pattern have FLAGE not equal to 3 or 4 and are therefore probably not in the appropriate group for scaling. They are consequently assigned a score of 98.
A10	MISSING	MISSING	YES	NO	NO	MISSING	YES	1	2	
A11	MISSING	MISSING	YES	YES	YES	MISSING	YES	2	5	
A12	MISSING	MISSING	YES	MISSING	MISSING	MISSING	NO	1	99	
A13	MISSING	MISSING	YES	MISSING	MISSING	MISSING	YES	2	99	
A14	MISSING	MISSING	YES	MISSING	MISSING	MISSING	MISSING	1	98	People with this response pattern have FLAGE not equal to 3 or 4 and are therefore probably not in the appropriate group for scaling. They are consequently assigned a score of 98.
A15	MISSING	MISSING	MISSING	NO	MISSING	MISSING	YES	1	99	
A16	MISSING	MISSING	MISSING	MISSING	YES	MISSING	YES	1	99	
A17	MISSING	MISSING	MISSING	MISSING	MISSING	MISSING	YES	175	99	
A18	MISSING	MISSING	MISSING	MISSING	MISSING	MISSING	MISSING	10566	99	

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NOTE: THE JOB EYH1005C HAS BEEN RUN UNDER RELEASE 79.5 OF SAS AT THE NATIONAL INS
**********************************************************************************
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**
**     NOTE: In n-way tables produced by PROC FREQ, missing data is used in calcul
**           the statistics for all character variables.  SAS Institute is aware o
**           problem and it will soon be corrected.
**
**********************************************************************************
**********************************************************************************

NOTE: SAS OPTIONS SPECIFIED ARE:
      NOOVP,NOCENTER


1           DATA A; INFILE INRAW1;
2             INPUT (PID FLAGE FL1-FL3 FL5-FL15)
3                   (@12 $CHAR7. @525 2*2. +2 2. +2 2. +6 2. +2 2. +2 2.
4                    +2 2. +2 2. +2 2. +2 2. +2 2. +2 2. +2 2. +2 2.);
5             IF FL9=1 THEN FL10=1;
6               *FIX-UP FL CODES FOR NON-FL SAMPLE THAT BRANCHED OUT;
7             ARRAY Z (I) FL5-FL14;
8               DO I=1 TO 10;
9                 IF FLAGE=4 AND FL1=2 AND FL2=2 THEN Z=2;
10                END;


NOTE: INFILE INRAW1 IS:
      DSNAME=NMCUES.PF12M0.APR29,ENCRYPT,
      UNIT=9T6250,VOL=SER=053664,LABEL=2,DISP=OLD,
      DCB=(BLKSIZE=13030,LRECL=2000,RECFM=VB)

NOTE: 31024 LINES WERE READ FROM INFILE INRAW1.
      THE MINIMUM LINE LENGTH IS 1431.
      THE MAXIMUM LINE LENGTH IS 1431.
NOTE: DATA SET WORK.A HAS 31024 OBSERVATIONS AND 17 VARIABLES. 279 OBS/TRK.
NOTE: THE DATA STATEMENT USED 12.43 SECONDS AND 180K.

1           PROC SORT; BY PID;

NOTE: DATA SET WORK.A HAS 31024 OBSERVATIONS AND 17 VARIABLES. 279 OBS/TRK.
NOTE: THE PROCEDURE SORT USED 3.69 SECONDS AND 372K.

2           DATA B; INFILE INRAW2;
3             INPUT (PID FL4)($CHAR7. 2.);


NOTE: INFILE INRAW2 IS:
      DSNAME=FL4.MAY24.ENCRYPT,
      UNIT=9T6250,VOL=SER=056251,DISP=OLD,
      DCB=(BLKSIZE=6347,LRECL=11,RECFM=FB)

NOTE: 29566 LINES WERE READ FROM INFILE INRAW2.
NOTE: DATA SET WORK.B HAS 29566 OBSERVATIONS AND 2 VARIABLES. 2055 OBS/TRK.
NOTE: THE DATA STATEMENT USED 2.06 SECONDS AND 172K.
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```
14          PROC SORT; BY PID;

NOTE: DATA SET WORK.B HAS 29566 OBSERVATIONS AND 2 VARIABLES. 2055 OBS/TRK.
NOTE: THE PROCEDURE SORT USED 2.37 SECONDS AND 376K.

15          DATA C; MERGE A B; BY PID;
16            IF FLAGE=4 AND FL1=2 AND FL2=2 THEN FL4=2;
17                *FOR SCORING PURPOSES; RECODE ITEMS TO 0, 1, AND 9  ;
18                *  TO DENOTE RESPONSES OF NO, YES, AND MISSING      ;
19            ARRAY FL (I) FL1 FL3 FL5-FL14;
20            ARRAY X  (I) X1 X3 X5-X14;
21              DO I=1 TO 12;
22                 IF FL NE 1 AND FL NE 2 THEN X=9;
23                 IF FL=1 THEN X=1;
24                 IF FL=2 THEN X=0;
25                 END;
26            IF FL4 NE 1 AND FL4 NE 2 AND FL4 NE 3 THEN X4=9;
27            IF FL4=1 THEN X4=1;
28            IF FL4=2 OR FL4=3 THEN X4=0;
29                *CREATE ITEM COMBINATIONS FOR SCALING;
30            C3_8=0;
31              IF X3=1 OR X8=1 OR (FLAGE=4 AND X1=1) THEN C3_8=1;
32              IF FLAGE NE 4 AND X3=9 AND X8=9 THEN C3_8=9;
33              IF FLAGE=4 AND X1=9 AND X8=9 THEN C3_8=9;
34            C4_7=0;
35              IF X4=1 OR X5=1 OR X6=1 OR X7=1 THEN C4_7=1;
36              IF X4=9 AND X5=9 AND X6=9 AND X7=9 THEN C4_7=9;
37            C12_13=0;
38              IF X12=1 OR X13=1 THEN C12_13=1;
39              IF X12=9 AND X13=9 THEN C12_13=9;
40                *CREATE RESPONSE PATTERN VARIABLE;
41            PATTERN = (X14*1000000) + (X11*100000) + (C4_7*10000) +
42                      (X9*1000) + (X10*100) + (C12_13*10) + C3_8;
43                *CREATE RESPONSE PATTERN FOR 4 MOBILITY ITEMS;
44            P4_7 = (X4*1000) + (X5*100) + (X6*10) + X7;
45                *FIX-UP FL CODES FOR NON-FL SAMPLE THAT BRANCHED OUT;
46            ARRAY F (J) FL4-FL14;
47              DO J=1 TO 11;
48                 IF PATTERN=9999990 THEN F=2;
49                 END;
50              IF PATTERN=9999990 THEN PATTERN=0000000;
51                 *IMPUTE SCALE SCORE VALUES;
52          SCORE = 98;
53          IF PATTERN = 0000000 THEN SCORE = 0;
54          IF PATTERN = 0000001 THEN SCORE = 1;
55          IF PATTERN = 0000010 THEN SCORE = 0;
56          IF PATTERN = 0000011 THEN SCORE = 2;
57          IF PATTERN = 0000100 THEN SCORE = 3;
58          IF PATTERN = 0000101 THEN SCORE = 3;
59          IF PATTERN = 0000110 THEN SCORE = 3;
60          IF PATTERN = 0000111 THEN SCORE = 3;
61          IF PATTERN = 0000900 THEN SCORE = 0;
62          IF PATTERN = 0000901 THEN SCORE = 1;
63          IF PATTERN = 0000911 THEN SCORE = 2;
64          IF PATTERN = 0001100 THEN SCORE = 4;
65          IF PATTERN = 0001101 THEN SCORE = 4;
66          IF PATTERN = 0001110 THEN SCORE = 4;
67          IF PATTERN = 0001111 THEN SCORE = 4;


3 S T A T I S T I C A L   A N A L Y S I S   S Y S T E M
                                28
68          IF PATTERN = 0009001 THEN SCORE = 1;
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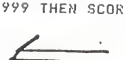
69          IF PATTERN = 0009111 THEN SCORE = 3;
70          IF PATTERN = 0009901 THEN SCORE = 1;
71          IF PATTERN = 0009911 THEN SCORE = 2;
72          IF PATTERN = 0010000 THEN SCORE = 0;
73          IF PATTERN = 0010001 THEN SCORE = 1;
74          IF PATTERN = 0010010 THEN SCORE = 2;
75          IF PATTERN = 0010011 THEN SCORE = 2;
76            IF PATTERN = 0010011 AND
77              (P4_7=0111 OR P4_7=1110 OR P4_7=1111)
78                                  THEN SCORE = 5;
79          IF PATTERN = 0010019 THEN SCORE = 2;
80          IF PATTERN = 0010100 THEN SCORE = 3;
81          IF PATTERN = 0010101 THEN SCORE = 3;
82          IF PATTERN = 0010110 THEN SCORE = 3;
83          IF PATTERN = 0010111 THEN SCORE = 3;
84            IF PATTERN = 0010111 AND
85              (P4_7=0111 OR P4_7=1101 OR P4_7=1110 OR P4_7=1111)
86                                  THEN SCORE = 5;
87          IF PATTERN = 0010901 THEN SCORE = 1;
88          IF PATTERN = 0010910 THEN SCORE = 2;
89          IF PATTERN = 0010911 THEN SCORE = 2;
90          IF PATTERN = 0011100 THEN SCORE = 5;
91          IF PATTERN = 0011101 THEN SCORE = 5;
92          IF PATTERN = 0011110 THEN SCORE = 5;
93          IF PATTERN = 0011111 THEN SCORE = 5;
94          IF PATTERN = 0019911 THEN SCORE = 5;
95          IF PATTERN = 0091101 THEN SCORE = 4;
96          IF PATTERN = 0099909 THEN SCORE = 99;
97          IF PATTERN = 0100001 THEN SCORE = 1;
98          IF PATTERN = 0100011 THEN SCORE = 2;
99          IF PATTERN = 0100101 THEN SCORE = 3;
100         IF PATTERN = 0100111 THEN SCORE = 3;
101         IF PATTERN = 0101101 THEN SCORE = 4;
102         IF PATTERN = 0101111 THEN SCORE = 4;
103         IF PATTERN = 0110001 THEN SCORE = 6;
104         IF PATTERN = 011001C THEN SCORE = 6;
105         IF PATTERN = 0110011 THEN SCORE = 6;
106         IF PATTERN = 0110101 THEN SCORE = 6;
107         IF PATTERN = 0110110 THEN SCORE = 6;
108         IF PATTERN = 0110111 THEN SCORE = 6;
109         IF PATTERN = 0111101 THEN SCORE = 6;
110         IF PATTERN = 0111110 THEN SCORE = 6;
111         IF PATTERN = 0111111 THEN SCORE = 6;
112         IF PATTERN = 0119111 THEN SCORE = 6;
113         IF PATTERN = 0900001 THEN SCORE = 1;
114         IF PATTERN = 0990991 THEN SCORE = 99;
115         IF PATTERN = 1000001 THEN SCORE = 1;
116         IF PATTERN = 1000010 THEN SCORE = 0;
117         IF PATTERN = 1000011 THEN SCORE = 2;
118         IF PATTERN = 1000101 THEN SCORE = 3;
119         IF PATTERN = 1000111 THEN SCORE = 3;
120         IF PATTERN = 1001111 THEN SCORE = 4;
121         IF PATTERN = 1010000 THEN SCORE = 99;
122         IF PATTERN = 1010001 THEN SCORE = 1;
123         IF PATTERN = 1010010 THEN SCORE = 2;
124         IF PATTERN = 1010011 THEN SCORE = 2;
125           IF PATTERN = 1010011 AND
```



```
126             (P4_7=1110 OR P4_7=1111)
127                                 THEN SCORE = 5;
```

```
129           IF PATTERN = 1010111 AND
130              (P4_7=0111 OR P4_7=1011 OR P4_7=1101 OR P4_7=1110 OR P4_7=1111
131                                  THEN SCORE = 5;
132           IF PATTERN = 1010911 THEN SCORE = 2;
133           IF PATTERN = 1011101 THEN SCORE = 5;
134           IF PATTERN = 1011110 THEN SCORE = 5;
135           IF PATTERN = 1011111 THEN SCORE = 5;
136           IF PATTERN = 1019911 THEN SCORE = 5;
137           IF PATTERN = 1100111 THEN SCORE = 7;
138           IF PATTERN = 1101111 THEN SCORE = 7;
139           IF PATTERN = 1110011 THEN SCORE = 7;
140           IF PATTERN = 1110111 THEN SCORE = 7;
141           IF PATTERN = 1111111 THEN SCORE = 7;
142           IF PATTERN = 9000000 THEN SCORE = 0;
143           IF PATTERN = 9000011 THEN SCORE = 2;
144           IF PATTERN = 9011111 THEN SCORE = 5;
145           IF PATTERN = 9019911 THEN SCORE = 5;
146           IF PATTERN = 9111111 THEN SCORE = 6;
147           IF PATTERN = 9900091 THEN SCORE = 1;
148           IF PATTERN = 9900191 THEN SCORE = 3;
149           IF PATTERN = 9901191 THEN SCORE = 4;
150           IF PATTERN = 9909991 THEN SCORE = 99;
151           IF PATTERN = 9910091 THEN SCORE = 1;
152           IF PATTERN = 9911191 THEN SCORE = 5;
153           IF PATTERN = 9919990 THEN SCORE = 99;
154           IF PATTERN = 9919991 THEN SCORE = 99;
155           IF PATTERN = 9990991 THEN SCORE = 99;
156           IF PATTERN = 9999191 THEN SCORE = 99;
157           IF PATTERN = 9999991 THEN SCORE = 99;
158           IF PATTERN = 9999999 THEN SCORE = 99;
159           IF FLAGE NE 3 AND FLAGE NE 4 AND PATTERN=9999999 THEN SCORE = 98;
160           FILE OUTRAW1;
161           PUT (PID FLAGE FL1-FL15 PATTERN SCORE)
162               ($CHAR7, +2 16*2, +2 7, +2 2,);
```



```
NOTE: FILE OUTRAW1 IS:
      DSNAME=NMCUES.FLSCALE.ENCRYPT,
      UNIT=9T6250,VOL=SER=045005,DISP=NEW,
      DCB=(BLKSIZE=5400,LRECL=54,RECFM=FB)

NOTE: 31024 LINES WERE WRITTEN TO FILE OUTRAW1.
NOTE: DATA SET WORK.C HAS 31024 OBSERVATIONS AND 38 VARIABLES. 126 OBS/TRK.
NOTE: THE DATA STATEMENT USED 29.29 SECONDS AND 184K.

NOTE: SAS USED 376K MEMORY.

NOTE: SAS INSTITUTE INC.
      SAS CIRCLE
      BOX 8000
      CARY, N.C. 27511
?
```

VOL = SER = AGØØ46

FLAGE	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
.	1453	.	.	.
1	69	69	0.233	0.233
2	8872	8941	30.002	30.236
3	1009	9950	3.412	33.648
4	19514	29464	65.990	99.638
96	10	29474	0.034	99.672
97	2	29476	0.007	99.679
98	95	29571	0.321	100.000

FL1	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
.	1453	.	.	.
1	6241	6241	21.105	21.105
2	13218	19459	44.699	65.804
94	1	19460	0.003	65.808
96	1	19461	0.003	65.811
97	7	19468	0.024	65.835
98	153	19621	0.517	66.352
99	9950	29571	33.648	100.000

FL2	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
.	1453	.	.	.
1	344	344	1.163	1.163
2	12763	13107	43.161	44.324
97	5	13112	0.017	44.341
98	268	13380	0.906	45.247
99	16191	29571	54.753	100.000

FL3	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
.	1453	.	.	.
1	644	644	2.178	2.178
2	715	1359	2.418	4.596
94	2	1361	0.007	4.602
97	3	1364	0.010	4.613
98	13412	14776	45.355	45.968
99	14795	29571	50.032	100.000

FL4	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
.	1454	.	.	.
1	1364	1364	4.613	4.613
2	17205	18569	58.184	62.797
3	1622	20191	5.485	68.282
94	2	20193	0.007	68.289
96	4	20197	0.014	68.302
97	4	20201	0.014	68.316
98	420	20621	1.420	69.736
99	8949	29570	30.264	100.000

FL5	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
.	1453			
1	1610	1610	5.445	5.445
2	18594	20204	62.879	68.324
94	1	20205	0.003	68.327
97	3	20208	0.010	68.337
98	758	20966	2.563	70.901
99	8605	29571	29.099	100.000

FL6	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
.	1453			
1	1443	1443	4.880	4.880
2	18812	20255	63.616	68.496
97	1	20256	0.003	68.500
98	429	20685	1.451	69.950
99	8886	29571	30.050	100.000

FL7	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
.	1453			
1	1093	1093	3.696	3.696
2	19158	20251	64.786	68.483
97	1	20252	0.003	68.486
98	433	20685	1.464	69.950
99	8886	29571	30.050	100.000

FL8	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
.	1453			
1	4424	4424	14.961	14.961
2	15819	20243	53.495	68.456
94	3	20246	0.010	68.466
96	1	20247	0.003	68.469
97	1	20248	0.003	68.472
98	437	20685	1.478	69.950
99	8886	29571	30.050	100.000

FL9	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
.	1453			
1	2988	2988	10.104	10.104
2	17257	20245	58.358	68.462
94	1	20246	0.003	68.466
97	1	20247	0.003	68.469
98	438	20685	1.481	69.950
99	8886	29571	30.050	100.000

FL10	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
.	1453	.	.	.
1	4312	4312	14.582	14.582
2	15907	20219	53.793	68.374
94	2	20221	0.007	68.381
97	2	20223	0.007	68.388
98	451	20674	1.525	69.913
99	8897	29571	30.087	100.000

FL11	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
.	1453	.	.	.
1	899	899	3.040	3.040
2	19347	20246	65.426	68.466
97	1	20247	0.003	68.469
98	438	20685	1.481	69.950
99	8886	29571	30.050	100.000

FL12	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
.	1453	.	.	.
1	4325	4325	14.626	14.626
2	15914	20239	53.816	68.442
94	1	20240	0.003	68.445
97	1	20241	0.003	68.449
98	444	20685	1.501	69.950
99	8886	29571	30.050	100.000

FL13	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
.	1453	.	.	.
1	3799	3799	12.847	12.847
2	16434	20233	55.575	68.422
97	1	20234	0.003	68.425
98	451	20685	1.525	69.950
99	8886	29571	30.050	100.000

FL14	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
.	1453	.	.	.
1	597	597	2.019	2.019
2	19645	20242	66.433	68.452
94	1	20243	0.003	68.456
97	1	20244	0.003	68.459
98	441	20685	1.491	69.950
99	8886	29571	30.050	100.000

FL15	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
.	1453	.	.	.
1	162	162	0.548	0.548
2	830	992	2.807	3.355
98	175	1167	0.592	3.946
99	28404	29571	96.054	100.000

PAT	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
0	13535	13535	43.628	43.628
1	1115	14650	3.594	47.222
10	60	14710	0.193	47.415
11	770	15480	2.482	49.897
100	12	15492	0.039	49.936
101	324	15816	1.044	50.980
110	14	15830	0.045	51.025
111	599	16429	1.931	52.956
900	1	16430	0.003	52.959
901	7	16437	0.023	52.982
911	10	16447	0.032	53.014
1100	12	16459	0.039	53.052
1101	217	16676	0.699	53.752
1110	5	16681	0.016	53.768
1111	879	17560	2.833	56.601
9001	1	17561	0.003	56.605
9111	1	17562	0.003	56.608
9301	1	17563	0.003	56.611
9311	1	17564	0.003	56.614
10000	19	17583	0.061	56.675
10001	66	17649	0.213	56.888
10010	55	17704	0.177	57.065
10011	205	17909	0.661	57.726
10019	1	17910	0.003	57.729
10100	1	17911	0.003	57.733
10101	42	17953	0.135	57.868
10110	7	17960	0.023	57.891
10111	255	18215	0.822	58.713
10901	1	18216	0.003	58.716
10910	3	18219	0.010	58.726
10911	6	18225	0.019	58.745
11100	2	18227	0.006	58.751
11101	39	18266	0.126	58.877
11110	6	18272	0.019	58.896
11111	875	19147	2.820	61.717
19911	3	19150	0.010	61.726
91101	1	19151	0.003	61.730
99909	1	19152	0.003	61.733
100001	12	19164	0.039	61.772
100011	2	19166	0.006	61.778
100101	1	19167	0.003	61.781
100111	11	19178	0.035	61.817
101101	4	19182	0.013	61.830
101111	59	19241	0.190	62.020
110001	2	19243	0.006	62.026
110010	2	19245	0.006	62.033
110011	13	19258	0.042	62.075
110101	1	19259	0.003	62.078
110110	1	19260	0.003	62.081
110111	21	19281	0.068	62.149
111101	5	19286	0.016	62.165
111110	1	19287	0.003	62.168
111111	355	19642	1.144	63.312
119111	1	19643	0.003	63.315
900001	1	19644	0.003	63.319
990991	1	19645	0.003	63.322

PAT	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
1000001	2	19647	0.006	63.328
1000010	1	19648	0.003	63.332
1000011	6	19654	0.019	63.351
1000101	1	19655	0.003	63.354
1000111	3	19658	0.010	63.364
1001111	12	19670	0.039	63.403
1010000	1	19671	0.003	63.406
1010001	1	19672	0.003	63.409
1010010	8	19680	0.026	63.435
1010011	21	19701	0.068	63.502
1010111	19	19720	0.061	63.564
1010911	1	19721	0.003	63.567
1011101	1	19722	0.003	63.570
1011110	1	19723	0.003	63.573
1011111	111	19834	0.358	63.931
1019911	1	19835	0.003	63.934
1100111	1	19836	0.003	63.938
1101111	5	19841	0.016	63.954
1110011	2	19843	0.006	63.960
1110111	6	19849	0.019	63.979
1111111	393	20242	1.267	65.246
9000000	1	20243	0.003	65.249
9000011	1	20244	0.003	65.253
9011111	1	20245	0.003	65.256
9019911	1	20246	0.003	65.259
9099999	1	20247	0.003	65.262
9111111	1	20248	0.003	65.266
9900091	3	20251	0.010	65.275
9900191	1	20252	0.003	65.278
9901191	1	20253	0.003	65.282
9909199	1	20254	0.003	65.285
9909991	10	20264	0.032	65.317
9909999	10	20274	0.032	65.349
9910091	1	20275	0.003	65.353
9911191	2	20277	0.006	65.359
9919990	1	20278	0.003	65.362
9919991	2	20280	0.006	65.369
9919999	1	20281	0.003	65.372
9990991	1	20282	0.003	65.375
9999191	1	20283	0.003	65.378
9999991	175	20458	0.564	65.942
9999999	10566	31024	34.058	100.000

SCORE	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
0	13617	13617	43.892	43.892
1	1211	14828	3.903	47.795
2	1075	15903	3.465	51.260
3	1258	17161	4.055	55.315
4	1190	18351	3.836	59.151
5	1091	19442	3.517	62.668
6	403	19845	1.299	63.967
7	407	20252	1.312	65.278
98	10447	30699	33.674	98.952
99	325	31024	1.048	100.000

Attachment III

July 12, 1982

To: Embry Howell

From: Jon Conklin

Subject: MEETING WITH CONSULTANTS AT RAND

On June 30, Jon Conklin of SysteMetrics met with John Ware, Ph.D. and Bob Brook, M. D. of RAND to discuss ongoing efforts of the NMCUES analysis to develop health status indicators. The discussion focused primarily on the scaling of the functional limitations battery. Both John Ware and Bob Brook expressed enthusiasm for our interest and our work in the area, and they endorsed the scaling approaches we are using. Small differences in the functional limitations scale as developed for the NMCUES data and the scales on the same items developed earlier for the HIS study by RAND were discussed and were attributed to differences in the focal populations. They were especially interested to find that in the NMCUES analyses the role-limitations items (items #12 and #13) fit well with the other functional limitations items to form a single scale. Although separate scales were required in the HIS, earlier studies had posited the existence of a single underlying scale.

In discussion about the properties of the derived scale, it was mutually agreed that it would be inappropriate to treat the scale (which is ordinal in nature) as if it were an interval-scale measure. Thus, it is inappropriate to compute average scale values across people. It is also inappropriate to treat such an ordinal measure as an independent variable in linear modeling. RAND is currently researching the viability of interval-scale conversion and use of alternative modeling approaches, and will communicate all findings directly.

The imputation scheme devised for use in the NMCUES analysis was identified as more liberal (i.e., resulted in limitations of greater severity than the scheme originally used by RAND, although our rationale was accepted.) Both John Ware and Bob Brook encouraged that a detailed examination of the obtained error response patterns be conducted before the imputation scheme be finalized. Such an examination is currently in progress.

Some degree of concern was expressed about the tentative plans in the NMCUES analysis to combine the various indicators of health status. Although such efforts to combine items do result in greater simplicity and parsimony, there is generally a substantial loss in detail and explanatory power. The approach typically used by RAND is to retain separate indicators rather than to combine items. They suggested caution in our attempts to derive a simple index of health status.

Overall, the meeting was successful. RAND was supportive of our scaling efforts and had good advice concerning our future analysis plans. An interest was expressed in continuing the exchange of ideas regarding health status measurement.

RESEARCH TRIANGLE INSTITUTE
POST OFFICE BOX 12194
RESEARCH TRIANGLE PARK, NORTH CAROLINA 27709

SAMPLING RESEARCH AND DESIGN CENTER

SRDC

December 17, 1982

MEMORANDUM

TO: Barbara Moser

FROM: Rick L. Williams RLW

SUBJECT: Edit and Imputation Plans for the Functional Limitation Score

Final plans for this variable have not been formulated. However, the following steps are being considered.

1. Edit the score against the cleaned age variable (WAGE) for consistence.

2. Separate out deceased individuals.

3. Statistically impute scores for those individuals for which the functional limitation battery was not administered or for which it was not possible to define a score.

4. Talk with Jon Conklin to see what plans are being made for subscales.

bkp

cc: B. Schlenger
L. Corder

(919) 541-6000 FROM RALEIGH, DURHAM AND CHAPEL HILL

SYSTEMETRICS, INC.
4520 East-West Highway • Suite 600 • Bethesda, Maryland 20814 • (301) 986-0111

MEMORANDUM

To: Barbara Moser

From: Jon Conklin MBR for JC

Date: February 22, 1983

Subject: Functional Limitations: Rand Sub-Scales

Enclosed please find a paper explaining the scaling methodology and a copy of the documentation for the tape containing the scaling factors. (The tapes was sent under separate cover last week.) Please distribute this paper and the documentation to the appropriate people.

Enclosure

MBR/dtb

xc: Rick Williams
GG Frick
Bill Schlegel

```
**********************************************************************
**                                                                  **
**    NOTE: In n-way tables produced by PROC FREQ, missing data is used i
**          the statistics for all character variables.  SAS Institute is
**          problem and it will soon be corrected.                  **
**                                                                  **
**********************************************************************

NOTE: SAS OPTIONS SPECIFIED ARE:
      NOOVP,NOCENTER


1          DATA A; INFILE INRAW1;
2            INPUT (PID FLAGE FL1-FL15 PATTERN SCORE)
3                  ($CHAR7, 15*2, 2., 2.);
4            IF FLAGE=4 AND FL1=2 AND FL2=2 THEN FL15=2;
5            IF PATTERN=0000000 AND (FL14 NE 1 AND FL14 NE 2) AND
6              (FL11 NE 1 AND FL11 NE 2) AND (FL10 NE 1 AND FL10 NE 2) ANI
7              (FL9 NE 1 AND FL9 NE 2) THEN FL15=2;
8            ARRAY FL (I) FL1-FL3 FL5-FL15;
9            ARRAY X  (I) X1-X3 X5-X15;
10             DO I=1 TO 14;
11               IF FL NE 1 AND FL NE 2 THEN X=9;
12               IF FL=1 THEN X=1;
13               IF FL=2 THEN X=0;
14             END;
15           IF FL4 NE 1 AND FL4 NE 2 AND FL4 NE 3 THEN X4=9;
16           IF FL4=1 THEN X4=1;
17           IF FL4=2 THEN X4=0;
18           IF FL4=3 THEN X4=3;
19           C1_3=0;
20             IF X3=1 OR (FLAGE=4 AND X1=1) THEN C1_3=1;
21             IF X3=9 AND (FLAGE NE 4 OR (FLAGE=4 AND X1=9)) THEN C1_3=9;
22           C8_9=0;
23             IF X8=1 OR X9=1 THEN C8_9=1;
24             IF X8=9 AND X9=9 THEN C8_9=9;
25         MOBILITY = (X7*1000) + (X6*100) + (X5*10) + X4;
26         PHYSACT1 = (X11*1000) + (C8_9*100) + (X10*10) + C1_3;
27           PHYSACT2 = (X11*10000) + (X9*1000) + (X10*100) + (X8*10) + C1_
28         ROLEACT = (X13*10) + X12;
29         SELFCARE = X14;
30         IF MOBILITY = 0000 THEN MOBSCOR = 0;
31         IF MOBILITY = 0001 THEN MOBSCOR = 1;
32         IF MOBILITY = 0003 THEN MOBSCOR = 0;
33         IF MOBILITY = 0009 THEN MOBSCOR = 0;
34         IF MOBILITY = 0010 THEN MOBSCOR = 0;
35         IF MOBILITY = 0011 THEN MOBSCOR = 2;
36         IF MOBILITY = 0013 THEN MOBSCOR = 2;
37         IF MOBILITY = 0019 THEN MOBSCOR = 2;
38         IF MOBILITY = 0090 THEN MOBSCOR = 0;
39         IF MOBILITY = 0091 THEN MOBSCOR = 1;
40         IF MOBILITY = 0093 THEN MOBSCOR = 0;
41         IF MOBILITY = 0099 THEN MOBSCOR = 99;


2 S T A T I S T I C A L   A N A L Y S I S   S Y S T E M
                              40
42         IF MOBILITY = 0100 THEN MOBSCOR
```

```
42          IF MOBILITY = 0100 THEN MOBSCOR = 0;
43          IF MOBILITY = 0101 THEN MOBSCOR = 3;
44          IF MOBILITY = 0103 THEN MOBSCOR = 3;
45          IF MOBILITY = 0110 THEN MOBSCOR = 3;
46          IF MOBILITY = 0111 THEN MOBSCOR = 3;
47          IF MOBILITY = 0113 THEN MOBSCOR = 3;
48          IF MOBILITY = 0119 THEN MOBSCOR = 3;
49          IF MOBILITY = 0191 THEN MOBSCOR = 3;
50          IF MOBILITY = 0193 THEN MOBSCOR = 3;
51          IF MOBILITY = 0199 THEN MOBSCOR = 3;
52          IF MOBILITY = 0900 THEN MOBSCOR = 0;
53          IF MOBILITY = 0903 THEN MOBSCOR = 0;
54          IF MOBILITY = 0999 THEN MOBSCOR = 99;
55          IF MOBILITY = 1000 THEN MOBSCOR = 0;
56          IF MOBILITY = 1001 THEN MOBSCOR = 1;
57          IF MOBILITY = 1003 THEN MOBSCOR = 0;
58          IF MOBILITY = 1010 THEN MOBSCOR = 2;
59          IF MOBILITY = 1011 THEN MOBSCOR = 2;
60          IF MOBILITY = 1013 THEN MOBSCOR = 2;
61          IF MOBILITY = 1091 THEN MOBSCOR = 1;
62          IF MOBILITY = 1100 THEN MOBSCOR = 4;
63          IF MOBILITY = 1101 THEN MOBSCOR = 4;
64          IF MOBILITY = 1103 THEN MOBSCOR = 4;
65          IF MOBILITY = 1109 THEN MOBSCOR = 4;
66          IF MOBILITY = 1110 THEN MOBSCOR = 4;
67          IF MOBILITY = 1111 THEN MOBSCOR = 4;
68          IF MOBILITY = 1113 THEN MOBSCOR = 4;
69          IF MOBILITY = 1119 THEN MOBSCOR = 4;
70          IF MOBILITY = 1190 THEN MOBSCOR = 4;
71          IF MOBILITY = 1191 THEN MOBSCOR = 4;
72          IF MOBILITY = 1193 THEN MOBSCOR = 4;
73          IF MOBILITY = 1199 THEN MOBSCOR = 4;
74          IF MOBILITY = 9003 THEN MOBSCOR = 0;
75          IF MOBILITY = 9099 THEN MOBSCOR = 99;
76          IF MOBILITY = 9900 THEN MOBSCOR = 0;
77          IF MOBILITY = 9901 THEN MOBSCOR = 1;
78          IF MOBILITY = 9903 THEN MOBSCOR = 99;
79          IF MOBILITY = 9909 THEN MOBSCOR = 99;
80          IF MOBILITY = 9911 THEN MOBSCOR = 2;
81          IF MOBILITY = 9919 THEN MOBSCOR = 99;
82          IF MOBILITY = 9991 THEN MOBSCOR = 99;
83          IF MOBILITY = 9993 THEN MOBSCOR = 99;
84          IF MOBILITY = 9999 THEN MOBSCOR = 99;
85          IF PHYSACT1 = 0000 THEN PHYSCOR1 = 0;
86          IF PHYSACT1 = 0001 THEN PHYSCOR1 = 1;
87          IF PHYSACT1 = 0009 THEN PHYSCOR1 = 0;
88          IF PHYSACT1 = 0010 THEN PHYSCOR1 = 0;
89          IF PHYSACT1 = 0011 THEN PHYSCOR1 = 2;
90          IF PHYSACT1 = 0019 THEN PHYSCOR1 = 2;
91          IF PHYSACT1 = 0090 THEN PHYSCOR1 = 0;
92          IF PHYSACT1 = 0091 THEN PHYSCOR1 = 1;
93          IF PHYSACT1 = 0100 THEN PHYSCOR1 = 0;
94          IF PHYSACT1 = 0101 THEN PHYSCOR1 = 1;
95          IF PHYSACT1 = 0109 THEN PHYSCOR1 = 0;
96          IF PHYSACT1 = 0110 THEN PHYSCOR1 = 3;
97          IF PHYSACT1 = 0111 THEN PHYSCOR1 = 3;
98          IF PHYSACT1 = 0119 THEN PHYSCOR1 = 3;
99          IF PHYSACT1 = 0190 THEN PHYSCOR1 = 0;
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100   IF PHYSACT1 = 0191 THEN PHYSCOR1 = 3;
101   IF PHYSACT1 = 0199 THEN PHYSCOR1 = 99;
102   IF PHYSACT1 = 0991 THEN PHYSCOR1 = 1;
103   IF PHYSACT1 = 0999 THEN PHYSCOR1 = 99;
104   IF PHYSACT1 = 1000 THEN PHYSCOR1 = 0;
105   IF PHYSACT1 = 1001 THEN PHYSCOR1 = 1;
106   IF PHYSACT1 = 1010 THEN PHYSCOR1 = 0;
107   IF PHYSACT1 = 1011 THEN PHYSCOR1 = 2;
108   IF PHYSACT1 = 1100 THEN PHYSCOR1 = 4;
109   IF PHYSACT1 = 1101 THEN PHYSCOR1 = 4;
110   IF PHYSACT1 = 1110 THEN PHYSCOR1 = 4;
111   IF PHYSACT1 = 1111 THEN PHYSCOR1 = 4;
112   IF PHYSACT1 = 1119 THEN PHYSCOR1 = 4;
113   IF PHYSACT1 = 9001 THEN PHYSCOR1 = 1;
114   IF PHYSACT1 = 9011 THEN PHYSCOR1 = 2;
115   IF PHYSACT1 = 9091 THEN PHYSCOR1 = 99;
116   IF PHYSACT1 = 9100 THEN PHYSCOR1 = 0;
117   IF PHYSACT1 = 9101 THEN PHYSCOR1 = 1;
118   IF PHYSACT1 = 9111 THEN PHYSCOR1 = 3;
119   IF PHYSACT1 = 9911 THEN PHYSCOR1 = 99;
120   IF PHYSACT1 = 9919 THEN PHYSCOR1 = 99;
121   IF PHYSACT1 = 9990 THEN PHYSCOR1 = 99;
122   IF PHYSACT1 = 9991 THEN PHYSCOR1 = 99;
123   IF PHYSACT1 = 9999 THEN PHYSCOR1 = 99;
124   IF PHYSACT2 = 0000 THEN PHYSCOR2 = 0;
125   IF PHYSACT2 = 0001 THEN PHYSCOR2 = 1;
126   IF PHYSACT2 = 0009 THEN PHYSCOR2 = 0;
127   IF PHYSACT2 = 0010 THEN PHYSCOR2 = 0;
128   IF PHYSACT2 = 0011 THEN PHYSCOR2 = 2;
129   IF PHYSACT2 = 0019 THEN PHYSCOR2 = 2;
130   IF PHYSACT2 = 0091 THEN PHYSCOR2 = 1;
131   IF PHYSACT2 = 0099 THEN PHYSCOR2 = 0;
132   IF PHYSACT2 = 0100 THEN PHYSCOR2 = 0;
133   IF PHYSACT2 = 0101 THEN PHYSCOR2 = 1;
134   IF PHYSACT2 = 0109 THEN PHYSCOR2 = 0;
135   IF PHYSACT2 = 0110 THEN PHYSCOR2 = 3;
136   IF PHYSACT2 = 0111 THEN PHYSCOR2 = 3;
137   IF PHYSACT2 = 0119 THEN PHYSCOR2 = 3;
138   IF PHYSACT2 = 0191 THEN PHYSCOR2 = 3;
139   IF PHYSACT2 = 0900 THEN PHYSCOR2 = 0;
140   IF PHYSACT2 = 0901 THEN PHYSCOR2 = 1;
141   IF PHYSACT2 = 0910 THEN PHYSCOR2 = 0;
142   IF PHYSACT2 = 0911 THEN PHYSCOR2 = 2;
143   IF PHYSACT2 = 0919 THEN PHYSCOR2 = 2;
144   IF PHYSACT2 = 1100 THEN PHYSCOR2 = 4;
145   IF PHYSACT2 = 1101 THEN PHYSCOR2 = 4;
146   IF PHYSACT2 = 1109 THEN PHYSCOR2 = 4;
147   IF PHYSACT2 = 1110 THEN PHYSCOR2 = 4;
148   IF PHYSACT2 = 1111 THEN PHYSCOR2 = 4;
149   IF PHYSACT2 = 1119 THEN PHYSCOR2 = 4;
150   IF PHYSACT2 = 9001 THEN PHYSCOR2 = 1;
151   IF PHYSACT2 = 9110 THEN PHYSCOR2 = 3;
152   IF PHYSACT2 = 9901 THEN PHYSCOR2 = 1;
153   IF PHYSACT2 = 9911 THEN PHYSCOR2 = 2;
154   IF PHYSACT2 = 9991 THEN PHYSCOR2 = 99;
155   IF PHYSACT2 = 9999 THEN PHYSCOR2 = 99;
156   IF PHYSACT2 =10000 THEN PHYSCOR2 = 0;
157   IF PHYSACT2 =10001 THEN PHYSCOR2 = 1;
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158          IF PHYSACT2 =10010 THEN PHYSCOR2 = 0;
159          IF PHYSACT2 =10011 THEN PHYSCOR2 = 2;
160          IF PHYSACT2 =10101 THEN PHYSCOR2 = 1;
161          IF PHYSACT2 =10111 THEN PHYSCOR2 = 3;
162          IF PHYSACT2 =10190 THEN PHYSCOR2 = 99;
163          IF PHYSACT2 =11100 THEN PHYSCOR2 = 5;
164          IF PHYSACT2 =11101 THEN PHYSCOR2 = 5;
165          IF PHYSACT2 =11110 THEN PHYSCOR2 = 5;
166          IF PHYSACT2 =11111 THEN PHYSCOR2 = 5;
167          IF PHYSACT2 =11119 THEN PHYSCOR2 = 5;
168          IF PHYSACT2 =19111 THEN PHYSCOR2 = 5;
169          IF PHYSACT2 =90001 THEN PHYSCOR2 = 1;
170          IF PHYSACT2 =90010 THEN PHYSCOR2 = 0;
171          IF PHYSACT2 =90011 THEN PHYSCOR2 = 2;
172          IF PHYSACT2 =90101 THEN PHYSCOR2 = 1;
173          IF PHYSACT2 =90991 THEN PHYSCOR2 = 99;
174          IF PHYSACT2 =91111 THEN PHYSCOR2 = 4;
175          IF PHYSACT2 =99191 THEN PHYSCOR2 = 99;
176          IF PHYSACT2 =99199 THEN PHYSCOR2 = 99;
177          IF PHYSACT2 =99990 THEN PHYSCOR2 = 99;
178          IF PHYSACT2 =99991 THEN PHYSCOR2 = 99;
179          IF PHYSACT2 =99999 THEN PHYSCOR2 = 99;
180          IF ROLEACT = 00 THEN ROLESCOR = 0;
181          IF ROLEACT = 01 THEN ROLESCOR = 1;
182          IF ROLEACT = 09 THEN ROLESCOR = 0;
183          IF ROLEACT = 10 THEN ROLESCOR = 0;
184          IF ROLEACT = 11 THEN ROLESCOR = 2;
185          IF ROLEACT = 19 THEN ROLESCOR = 2;
186          IF ROLEACT = 90 THEN ROLESCOR = 0;
187          IF ROLEACT = 91 THEN ROLESCOR = 1;
188          IF ROLEACT = 99 THEN ROLESCOR = 99;
189          IF SELFCARE = 0 THEN SELFSCOR = 0;
190          IF SELFCARE = 1 THEN SELFSCOR = 1;
191          IF SELFCARE = 9 THEN SELFSCOR = 99;
192          IF FLAGE NE 3 AND FLAGE NE 4 THEN MOBSCOR = 98;
193          IF FLAGE NE 3 AND FLAGE NE 4 THEN PHYSCOR1= 98;
194          IF FLAGE NE 3 AND FLAGE NE 4 THEN PHYSCOR2= 98;
195          IF FLAGE NE 3 AND FLAGE NE 4 THEN ROLESCOR= 98;
196          IF FLAGE NE 3 AND FLAGE NE 4 THEN SELFSCOR= 98;
197         FILE OUTRAW1;
198         PUT (PID FLAGE FL1-FL15 MOBILITY PHYSACT1 PHYSACT2 ROLEACT SELFCARE
199              MOBSCOR PHYSCOR1 PHYSCOR2 ROLESCOR SELFSCOR)
200             ($CHAR7. +2 16*2. +2 2*4. 5. 2. 1. +2 5*2.);
```

```
NOTE: INFILE INRAW1 IS:
      DSNAME=NMCUES.FLSCALE.ENCRYPT,
      UNIT=9T6250,VOL=SER=045886,DISP=OLD,
      DCB=(BLKSIZE=5400,LRECL=54,RECFM=FB)

NOTE: FILE OUTRAW1 IS:
      DSNAME=NMCUES.FLSUB.ENCRYPT, (AG0047)
      UNIT=9T6250,VOL=SER=011249,DISP=NEW,
      DCB=(BLKSIZE=7100,LRECL=71,RECFM=FB)

NOTE: 31024 LINES WERE READ FROM INFILE INRAW1.
NOTE: 31024 LINES WERE WRITTEN TO FILE OUTRAW1.
NOTE: DATA SET WORK.A HAS 31024 OBSERVATIONS AND 47 VARIABLES. 102 OBS/TRK.
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Attachment VI

FUNCTIONAL LIMITATIONS; RAND SUB-SCALES

In two earlier papers a general scale was created to describe the response patterns in the Functional Limitations battery for the NMCUES data and an imputation rule was defined for assigning scale scores to error response and missing data patterns. By creating a single scale that describes the responses to the 13 items in the battery, the NMCUES scaling effort differs from the scaling conducted by RAND (Stewart, et al, 1978) of nearly identical items in the Health Insurance Study. Five subscales were derived by RAND to depict different dimensions of limitations in the Functional Limitations battery. These subscales describe limitations in mobility, physical activities, role activities, self-care, and general limitations. The scales were created using the same Guttman scaling procedure as was used in the NMCUES scaling effort. The underlying motivation in the RAND efforts was to account for as much variation as possible, and to retain potentially distinct sub-dimensions of functional limitation. The motivation in the NMCUES scaling effort was for parsimony. A distinct attempt was made to develop a single valid scale to describe functional limitations.

Each of the five RAND subscales defines a distinct functional dimension and is made up of different constituent items. The Mobility subscale describes one's ability to get around the community and is made up of four items:

* Item 4 - Health limits ability to drive a car
* Item 5 - Health limits ability to get around community without assistance
* Item 6 - Health causes to stay indoors most of the day
* Item 7 - Health causes to stay in bed or chair most of the day

The Physical Activities subscale describes the extent to which one is limited due to health in ability to engage in physical activities. It is made up of five items:

* Item 3(1)- Health limits ability to engage in vigorous activities
* Item 8 - Health limits ability to bend, stoop, lift
* Item 9 - Health limits ability to walk one block or climb one flight of stairs
* Item 10 - Health limits ability to walk several blocks or climb several flights of stairs
* Item 11 - Health limits ability to walk without assistance

The Role Activities subscale describes one's ability to perform work within his/her role (at home, school, or job) and is made up of two items:

* Item 12 - Health limits ability to do certain kinds/ amounts of work
* Item 13 - Health limits ability to work at all

The Self-Care subscale is made up of one item (#14) and describes the extent to which one is limited in ability to eat, dress, bathe, etc. The General Limitations subscale is also made up of a single item (#15(2)) and describes the extent to which one is limited in anything he/she wants to do.

At the request of the Project Officer, four of the five RAND subscales have been examined and created for use in the NMCUES study and values have been imputed for inclusion on computer files. The fifth subscale consists of the general limitations item which is missing for the large majority of the NMCUES sample and is therefore not created.

The actual ordering of the items in the RAND subscales can be found in the tables that follow this paper. In the Physical Activities subscale items 8 and 9 were combined to define a single scale value. To assess the applicability of these scales to the NMCUES data base, the items making up the three multiple-item subscales were analyzed using the Guttman scaling routine. The items were found to define valid and distinct subscales, and for the Mobility and Role Activities subscales the ordering of the items matched that defined by RAND. For the Physical Activities subscale the items were ordered differently. To fit the NMCUES data, the subscale had to be structured so that item #8 defined the next to lowest scale value, with item #10 and item #9 respectively defining sequentially higher scale values. Because there may be some interest in analyzing the PHysical Activities subscale as originally constructed by RAND (although created for a different data base and of questionable validity for NMCUES) it has been included on the data file in addition to the corresponding subscale that was created for the NMCUES data. The former is labeled as Physical Activities I and the latter is labeled as Physical Activities II. With the exception of this subscale, the RAND and NMCUES subscales are identical, and therefore only one version of each is included on the data file.

As in the previous scaling effort, several item records were required prior to the analyses to account for condition codes resulting from the item branching scheme used in the questionnaire:

* All people in the non-FL sample who responded NO to both items #1 and #2, and who therefore skipped all remaining FL items on the assumption that they would respond negatively to those items as well, were assigned NO responses to items #4-15.

* A small group of people in the non-FL sample who responded NO to item #1 but had missing values for all remaining items were also assigned NO responses to items #4-#15.

* All people (in both the FL and non-FL groups) that indicated they were limited on item #9 had missing value codes for item #10. Under the assumption that people with limitations on item #9 (walking one block) were by definition limited on item #10 (walking several blocks), item #10 has been recoded to YES for all people that responded YES to item #9.

* For item #4, response codes of "2" and "3" were coded as NO responses since neither denoted an inability to drive a car caused by health problems.

The imputation of scale scores for these subscales was conducted using the same rules that were used to impute scores for the seven-level Functional Limitations Scale. These imputation rules are similar to those used by RAND in its development of the various subscales for the Health Interview Study. The basic rules are described below, and are used to assign scale scores in the tables that follow.

* When a YES response to a more severe limitation is accompanied by a NO response to the next less severe limitation, then the YES is treated as a NO.

* When YES responses are obtained to two adjacent items, then the score value imputed is the scale level of the most severe limitation of the adjacent YES responses.

* When more than 50% of the original FL items (prior to formation of item combinations) are missing, or when a scale value cannot be logically imputed, a score of 99 is assigned.

* Generally, for cases with less than 50% missing items, a missing response to a scale level more extreme (in terms of limitations) than an obtained YES response is treated as if it were a NO response. A missing response to a scale level adjacent and less extreme than an obtained YES response is treated as if it were also a YES response.

* Exceptions to the above rules are made when the patterns of responses suggest that a functional limitation is truly present despite apparent inconsistencies in YES, NO, and missing responses. In these cases, decisions are based on theoretical considerations.

* People in the NMCUES population that are deceased or under 17 are assigned a score of 98.

The recoded functional limitation items, the item response patterns for each of the subscales, and the imputed subscale scores for all people in the NMCUES sample have been saved on computer files and have been forwarded to RTI.

Pattern Number	RESPONSE PATTERN (Item 7) Stay in Bed/Chair Due to Health	(Item 6) Stay Indoors Due to Health	(Item 5) Need Assistance Getting Around Community	(Item 4) Can't Drive Car Due to Health	Number of People	Scale Score	Notes
1	NO	NO	NO	NO	16734	0 (98)	10 coded 98 (FLAGE NE 3 or 4)
2	NO	NO	NO	YES	402	1	
3	NO	NO	NO	DON'T DRIVE	876	0 (98)	1 coded 98 "
4	NO	NO	NO	MISSING	31	0 (98)	21 coded 98 "
5	NO	NO*	YES	NO	65	0	
6	NO	NO	YES	YES	239	2	
7	NO	NO	YES	DON'T DRIVE	211	2	
8	NO	NO	YES	MISSING	4	2 (98)	1 coded 98 "
9	NO	NO	MISSING	NO	8	0	
10	NO	NO	MISSING	YES	3	1	
11	NO	NO	MISSING	DON'T DRIVE	12	0	
12	NO	NO	MISSING	MISSING	28	99 (98)	17 coded 98 "
13	NO	YES	NO	NO	115	0 (98)	1 coded 98 "
14	NO	YES	NO	YES	46	3	Coded as 3 since Item 6 is more tangit
15	NO	YES	NO	DON'T DRIVE	76	3	and therefore likely to be more reliab
16	NO	YES	YES	NO	32	3	
17	NO	YES	YES	YES	152	3	
18	NO	YES	YES	DON'T DRIVE	113	3	
19	NO	YES	YES	MISSING	2	3	
20	NO	YES	MISSING	YES	1	3	
21	NO	YES	MISSING	DON'T DRIVE	2	3	
22	NO	YES	MISSING	MISSING	3	3 (98)	1 coded 98 (FLAGE NE 3 or 4)
23	NO	MISSING	NO	NO	1	0	
24	NO	MISSING	NO	DON'T DRIVE	1	0	
25	NO	MISSING	MISSING	MISSING	1	98	FLAGE NE 3 or 4
26	YES	NO	NO	NO	66	0	
27	YES	NO	NO	YES	19	1	
28	YES	NO	NO	DON'T DRIVE	15	0	
29	YES	NO	YES	NO	13	2	Yes response to Item 7 gives more stre
30	YES	NO	YES	YES	58	2	to Item 5 response, therefore coded 2
31	YES	NO	YES	DON'T DRIVE	20	2	than 0.
32	YES	NO	MISSING	YES	1	1	
33	YES	YES	NO	NO	112	4 (98)	1 coded 98 (FLAGE NE 3 or 4)
34	YES	YES	NO	YES	49	4	
35	YES	YES	NO	DON'T DRIVE	33	4	
36	YES	YES	NO	MISSING	2	4 (98)	1 coded 98 "
37	YES	YES	YES	NO	50	4	
38	YES	YES	YES	YES	389	4	
39	YES	YES	YES	DON'T DRIVE	253	4 (98)	1 coded 98 "
40	YES	YES	YES	MISSING	6	4 (98)	3 coded 98 "
41	YES	YES	MISSING	NO	1	4	
42	YES	YES	MISSING	YES	1	4	
43	YES	YES	MISSING	DON'T DRIVE	2	4	
44	YES	YES	MISSING	MISSING	3	4 (98)	1 coded 98 "
45	MISSING	NO	NO	DON'T DRIVE	3	0	
46	MISSING	NO	MISSING	MISSING	4	98	FLAGE NE 3 or 4
47	MISSING	MISSING	NO	NO	8	0	
48	MISSING	MISSING	NO	YES	1	1	
49	MISSING	MISSING	NO	DON'T DRIVE	3	99	
50	MISSING	MISSING	NO	MISSING	1	98	FLAGE NE 3 or 4
51	MISSING	MISSING	YES	YES	2	2	
52	MISSING	MISSING	YES	MISSING	1	98	FLAGE NE 3 or 4
53	MISSING	MISSING	MISSING	YES	1	99	
54	MISSING	MISSING	MISSING	DON'T DRIVE	2	99	
55	MISSING	MISSING	MISSING	MISSING	10747	99 (98)	10435 coded 98 (FLAGE NE 3 or 4)

PHYSICAL ACTIVITIES I SUB-SCALE: RESPONSE PATTERNS, IMPUTED SCALE SCORES

ORIGINAL RAND SCALE

Pattern Number	RESPONSE PATTERN (Item 11) Need Assistance Walking	(Items 8,9) Trouble Bending, Etc. or Walking One Block	(Item 10) Trouble Walking Several Blocks or Climbing a Few Flights of Stairs	(Items 1,3) Limited In Vigorous Activities	Number of People	Scale Score	Notes
1	NO	NO	NO	NO	13642	0 (98)	11 coded 98 (FLAGE NE 3 or 4)
2	NO	NO	NO	YES	1228	1 (98)	1 coded 98 " "
3	NO	NO	NO	MISSING	39	0 (98)	25 coded 98 " "
4	NO	NO	YES	NO	29	0	
5	NO	NO	YES	YES	421	2	
6	NO	NO	YES	MISSING	5	2 (98)	1 coded 98 " "
7	NO	NO	MISSING	NO	4	0	
8	NO	NO	MISSING	YES	10	1	
9	NO	YES	NO	NO	36	0	
10	NO	YES	NO	YES	911	1 (98)	1 coded 98 " "
11	NO	YES	NO	MISSING	13	0 (98)	3 coded 98 " "
12	NO	YES	YES	NO	94	3	
13	NO	YES	YES	YES	2884	3	
14	NO	YES	YES	MISSING	27	3 (98)	8 coded 98 " "
15	NO	YES	MISSING	NO	1	0	Response to item 8,9 thought not to be reliable if response to item 1,3 was NO.
16	NO	YES	MISSING	YES	16	3	
17	NO	YES	MISSING	MISSING	1	99	
18	NO	MISSING	MISSING	YES	4	1	
19	NO	MISSING	MISSING	MISSING	2	99 (98)	1 coded 98 (FLAGE NE 3 or 4)
20	YES	NO	NO	NO	2	0	
21	YES	NO	NO	YES	21	1	
22	YES	NO	YES	NO	1	0	
23	YES	NO	YES	YES	10	2	
24	YES	YES	NO	NO	1	4	
25	YES	YES	NO	YES	9	4	
26	YES	YES	YES	NO	8	4	
27	YES	YES	YES	YES	840	4	
28	YES	YES	YES	MISSING	7	4 (98)	4 coded 98 " "
29	MISSING	NO	NO	YES	2	1	
30	MISSING	NO	YES	YES	1	2	
31	MISSING	NO	MISSING	YES	2	99	
32	MISSING	YES	NO	NO	1	0	
33	MISSING	YES	NO	YES	2	1	
34	MISSING	YES	YES	YES	3	3	
35	MISSING	MISSING	YES	YES	1	99	
36	MISSING	MISSING	YES	MISSING	1	98	FLAGE NE 3 or 4
37	MISSING	MISSING	MISSING	NO	1	99	
38	MISSING	MISSING	MISSING	YES	187	99	
39	MISSING	MISSING	MISSING	MISSING	10577	99 (98)	10445 coded 98 (FLAGE NE 3 or 4)

PHYSICAL ACTIVITIES II SUB-SCALE: RESPONSE PATTERNS, IMPUTED SCALE SCORES
RESCALED FOR NHCUES DATA

Pattern Number	RESPONSE PATTERN (Item 11) Assistance Walking	(Item 9) Walk One Block	(Item 10) Walk Several Blocks	(Item 8) Trouble Bending, etc.	(Items 1,3) Vigorous Activities	Number of People	Scale Score	Notes
1	NO	NO	NO	NO	NO	13642	0 (96)	11 coded 98 (FLAGGE NE 3 or 4)
2	NO	NO	NO	NO	YES	1226	1 (98)	1 coded 98 "
3	NO	NO	NO	NO	MISSING	38	0 (98)	25 coded 98 "
4	NO	NO	NO	YES	NO	36	0	
5	NO	NO	NO	YES	YES	911	2 (98)	1 coded 98 "
6	NO	NO	NO	YES	MISSING	13	2 (98)	3 coded 98 "
7	NO	NO	NO	MISSING	YES	1	1	
8	NO	NO	NO	MISSING	MISSING	1	0	
9	NO	NO	YES	NO	NO	29	0	
10	NO	NO	YES	NO	YES	418	1	
11	NO	NO	YES	NO	MISSING	5	0 (98)	1 coded 98 "
12	NO	NO	YES	YES	NO	17	3	
13	NO	NO	YES	YES	YES	802	3	
14	NO	NO	YES	YES	MISSING	3	3	
15	NO	NO	YES	MISSING	YES	3	3	
16	NO	NO	MISSING	NO	NO	4	0	
17	NO	NO	MISSING	NO	YES	9	1	
18	NO	NO	MISSING	YES	NO	1	0	
19	NO	NO	MISSING	YES	YES	14	2	
20	NO	NO	MISSING	YES	MISSING	1	2	
21	NO	YES	YES	NO	NO	22	4	
22	NO	YES	YES	NO	YES	340	4	
23	NO	YES	YES	NO	MISSING	4	4 (98)	2 coded 98 "
24	NO	YES	YES	YES	NO	34	4	
25	NO	YES	YES	YES	YES	1742	4	
26	NO	YES	YES	YES	MISSING	20	4 (98)	6 coded 98 "
27	NO	MISSING	NO	NO	YES	1	1	
28	NO	MISSING	YES	YES	NO	1	3	
29	NO	MISSING	MISSING	NO	YES	1	1	
30	NO	MISSING	MISSING	YES	YES	2	2	
31	NO	MISSING	MISSING	MISSING	YES	4	99	
32	NO	MISSING	MISSING	MISSING	MISSING	2	99 (98)	1 coded 98 "
33	YES	NO	NO	NO	NO	2	0	
34	YES	NO	NO	NO	YES	21	1	
35	YES	NO	NO	YES	NO	1	0	
36	YES	NO	NO	YES	YES	9	2	
37	YES	NO	YES	NO	YES	10	1	
38	YES	NO	YES	YES	NO	1	99	Impossible to logically impute score val
39	YES	NO	YES	YES	YES	43	5	
40	YES	YES	YES	MISSING	NO	7	5	
41	YES	YES	YES	NO	NO	765	5	
42	YES	YES	YES	NO	YES	7	5 (98)	4 coded 98 (FLAGE NE 3 or 4)
43	YES	YES	YES	YES	NO	1	5	
44	YES	YES	YES	YES	YES	2	1	
45	YES	MISSING	YES	YES	MISSING	1	0	
46	MISSING	NO	NO	NO	YES	2	2	
47	MISSING	NO	NO	YES	NO	1	1	
48	MISSING	NO	NO	YES	YES	2	99	
49	MISSING	NO	YES	NO	YES	3	4	
50	MISSING	NO	YES	YES	NO	1	99	
51	MISSING	YES	MISSING	MISSING	YES	1	99	
52	MISSING	MISSING	YES	YES	NO	1	98	FLAGE NE 3 or 4
53	MISSING	MISSING	YES	MISSING	YES	1	99	
54	MISSING	MISSING	YES	MISSING	MISSING	187	99	
55	MISSING	MISSING	MISSING	MISSING	NO	10577	99 (98)	10445 coded 98 (FLAGE NE 3 or 4)
56	MISSING	MISSING	MISSING	MISSING	YES			
				MISSING	MISSING			

ROLE ACTIVITIES SUB-SCALE: RESPONSE PATTERNS, IMPUTED SCALE SCORES

Pattern Number	RESPONSE PATTERN (Item 13) Can't Work Due to Health	RESPONSE PATTERN (Item 12) Limited in Kinds/Amounts of Work	Number of People	Scale Score	Notes
1	NO	NO	15419	0 (98)	35 coded 98 (FLAGE NE 3 or 4)
2	NO	YES	1012	1 (98)	3 coded 98 "
3	NO	MISSING	3	0	
4	YES	NO	487	0 (98)	2 coded 98 "
5	YES	YES	3308	2 (98)	14 coded 98 "
6	YES	MISSING	4	2	
7	MISSING	NO	8	0	
8	MISSING	YES	5	1	
9	MISSING	MISSING	10778	99 (98)	10447 coded 98 "

SELF CARE SUB-SCALE

Pattern Number	(Item 14) Limited in Self-Care	Number of People	Scale Score	Notes
1	NO	19645	0 (98)	48 coded 98 (FLAGE NE 3 or 4)
2	YES	597	1 (98)	6 coded 98 "
3	MISSING	10782	99 (98)	10447 coded 98 "

APPENDIX

The Functional Limitations Battery

FUNCTIONAL LIMITATIONS

FOR PERSONS "DECEASED" OR "UNDER 17" CODE 01 OR 02 AS APPROPRIATE. THEN REFER TO SPECIAL INSTRUCTIONS, SECTION A OF CONTROL CARD. FOR EACH (OTHER) PERSON 17 YEARS OF AGE OR OLDER CODE WHETHER RU IS IN FL SAMPLE. THEN ASK ALL APPROPRIATE QUESTIONS FOR ONE PERSON BEFORE GOING ON TO NEXT PERSON.

The next questions are about ways that a person might be limited because of any health problem or physical condition (other than pregnancy).

		PERSON 1
		Deceased. . . . . .01(NP)
		Under 17. . . . . .02(NP)
		17 or older:
		RU in FL sample. . . . .03(3)
		RU not in FL sample. . . .04(1)
1. Does health limit the kind of vigorous activities (PERSON) can do, such as running, lifting heavy objects, or participating in strenuous sports?	1	Yes . . . . . .01(A)
		No. . . . . .02(2)
A. Has health limited the kind of vigorous activities (PERSON) can do for more than three months?	A	Yes . . . . . .01(4)
		No. . . . . .02(4)
2. Does health limit (PERSON) in any way in doing anything [he/she] wants to do?	2	Yes . . . . . .01(A)
		No. . . . . .02(NP)
A. Has health limited (PERSON) in doing things [he/she] wants to do for more than three months?	A	Yes . . . . . .01(4)
		No. . . . . .02(4)
3. Does health limit the kind of vigorous activities (PERSON) can do, such as running, lifting heavy objects, or participating in strenuous sports?	3	Yes . . . . . .01(A)
		No. . . . . .02(4)
A. Has health limited the kind of vigorous activities (PERSON) can do for more than three months?	A	Yes 01
		No. 02
4. Does health keep (PERSON) from driving a car?	4	Yes . . . . . .01(A)
		No. . . . . .02(5)
		Never drove a car . . . . . .03(5)
A. Has (PERSON) been unable to drive a car because of health for more than three months?	A	Yes 01
		No. 02
5. When (PERSON) travels around your community, does someone have to assist [him/her] because of health?	5	Yes . . . . . .01(A)
		No. . . . . .02(6)
A. Has (PERSON) needed someone to assist [him/her] in traveling around your community for more than three months?	A	Yes 01
		No. 02

FUNCTIONAL LIMITATIONS

		PERSON 1
6. Does (PERSON) have to stay indoors all or most of the day because of health?	6	Yes . . . . . 01(A)
		No. . . . . 02(7)
A. Has (PERSON) had to stay indoors all or most of the day because of health for more than three months?	A	Yes 01
		No. 02
7. Is (PERSON) in bed or a chair for all or most of the day because of health?	7	Yes . . . . . 01(A)
		No. . . . . 02(8)
A. Has (PERSON) been in bed or in a chair all or most of the day because of health for more than three months?	A	Yes 01
		No. 02
8. Does (PERSON) have trouble bending, lifting, or stooping because of health?	8	Yes . . . . . 01(A)
		No. . . . . 02(9)
A. Has (PERSON) had trouble bending, lifting, or stooping because of health for more than three months?	A	Yes 01
		No. 02
9. Does (PERSON) have any trouble either walking <u>one</u> block or climbing <u>one</u> flight of stairs because of health?	9	Yes . . . . . 01(A)
		No. . . . . 02(10)
A. Has (PERSON) had trouble walking one block or climbing one flight of stairs because of health for more than three months?	A	Yes . . . . . 01(11)
		No. . . . . 02(11)
10. Does (PERSON) have any trouble either walking <u>several</u> blocks or climbing a <u>few</u> flights of stairs because of health?	10	Yes . . . . . 01(A)
		No. . . . . 02(11)
A. Has (PERSON) had trouble walking several blocks or climbing a few flights of stairs because of health for more than three months?	A	Yes 01
		No. 02